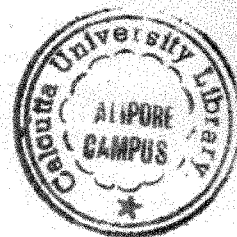
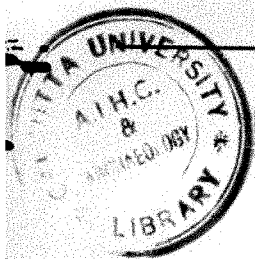


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c/o Department of Archaeology
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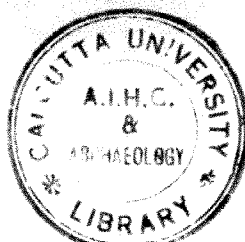
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Editorial

This issue of the Journal carries articles on Palaeolithic technology as well as on the methodology of its study, palynology, archaeobotany, biological anthropology, and several other topics including exploration and excavation reports. The steadily increasing number of contributions on bio-archaeology in recent issues reflects a welcome shift from traditional archaeology with its preoccupation with exploration, excavation, stratigraphy, culture sequences, and the study of material culture remains like stone tools and pottery. The shift heralds the emergence and development of new trends in archaeological research in India. It means that more and more archaeologists are becoming aware of the value of biological material, are collecting it in their excavations, and are seeking the help of specialists in the natural sciences for its study and interpretation. It also means that slowly but steadily expertise in various branches of bio-archaeology is developing in the country. We are happy that *Man and Environment* is able to provide a forum for the timely publication of this important new research.

During 1990 several international conferences were held which partly included or were entirely devoted to South Asian archaeology and related disciplines. These included the 6th Conference of the International Council for Archaeozoology, held at Washington, D.C., U.S.A., the 14th Congress of the Indo-Pacific Prehistory Association, held at Yogyakarta, Indonesia, the conference on "Towards the Second Century of Archaeology in Sri Lanka", held at Colombo, Sri Lanka to celebrate the centenary of the Archaeology Department of Sri Lanka, and the conference on "Environmental Change and Human Response: Last Two Million Years", held at Deccan College, Pune. We are publishing brief reports of these conferences in the Journal to draw the attention of readers to new developments in various fields of archaeology.

The response to our appeals for manuscripts in previous issues of the Journal has been very positive. We are now receiving a sufficient number of manuscripts. We hope this cooperation from our members will continue.

Our only regret is that in spite of our repeatedly drawing the attention of readers to follow the guidelines for manuscript preparation printed in Volume XIII of the Journal hardly any author follows them. We repeat that the prompt publication of papers will not be possible due to the increase in editorial work that such negligence entails.

The Editor of the Journal of the Geological Society of India has expressed a keen desire to publish in his journal abstracts of the papers appearing in *Man and Environment*. Therefore beginning with this issue we have started printing abstracts of all papers. Authors of papers for future issues of the Journal are requested to send us an abstract of their papers along with the main paper.

Ancient Indian Iron Metallurgy*

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Abstract

This paper presents a brief summary of the author's work on ancient Indian iron metallurgy. Iron technology in India developed on the basis of a long tradition of successful copper technology. By the 4th century B.C. a knowledge of iron technology had spread all over the country. The Asokan pillars and the cave temples bear testimony to the excellent quality of ancient Indian iron technology and tools. Aspects of the development of this technology are described in this paper.

I would like to thank the members of the Executive Committee of the Indian Society for Prehistoric and Quaternary Studies most warmly and most sincerely, for electing me their President for 1989-90. I am indeed grateful for their appreciation of my small contribution to the study of Indian Archaeology. Much has been written and said about my work on ancient Indian copper metallurgy, the production of bronze alloy, and ancient Indian zinc distillation technology and the production of brass alloy. Not much is known about my work on ancient Indian iron metallurgy. Therefore, I propose to present before you a brief summary of my work on this subject.

Excavations at Atranjikhhera (Gaur 1983) and Hallur (Nagaraja Rao 1971) have brought to light the earliest iron objects in India. They are few in number and heavily corroded. They were dated by radiocarbon to the 11th and 9th centuries B.C. respectively. At Hastinapura (Lal 1955), Kausambi (Sharma 1960) and Alamgirpur in the levels dated to the 7th century B.C., identifiable remains of iron objects have been recovered, including arrowheads, spearheads, daggers and knives. The archaeological evidence unearthed from levels dated to the 6th and 5th centuries B.C. at Taxila (Marshall 1951), Rupar (Sharma 1956), Hastinapura (Lal 1955), Sonkh (IAR 1966-67), Kausambi (Sharma 1960), Rajghat (Narain and Roy 1977) and Ujjain (Banerjee 1965) show a very large number of weapons made from iron, like spearheads, arrowheads, daggers and knives. This large-scale increase in the production of weapons indicates that the contemporary iron industry was geared to meet the military

requirements of the ambitious chiefs of the *mahajanapadas* who were continuously engaged in warfare. No wonder then, that in the 4th century B.C. the rulers of Magadh, where extensive, good quality iron ore was available, were able to exercise control over much of the Subcontinent.

By the 4th century B.C. the knowledge of iron technology had spread all over the country and the industry had reached its mature stage. This is amply reflected in the nation-wide occurrence of a wide range of iron weapons and implements recovered from the contemporary archaeological records. The records show an enormous increase in iron objects and a much wider range of weapons and implements. They include, in addition to arrowheads, spearheads, daggers and knives, parallel sided swords, leaf-shaped spearheads, and barbed arrowheads. Among the more common tools were the chisels with rectangular and square sections, straight-sided knives, ploughshares, sickles, nails and socketed axes. At this stage, Indian iron was also renowned for its quality. It was much appreciated by Alexander of Macedonia (Banerjee 1965), Kautilya (Shamasastri 1960) and also Herodotus. Numerous standing monuments of the last quarter of the 1st millennium B.C. like the Asokan pillars, cave temples carved into rocks and temples built of blocks of stone are a testimony to the excellent quality of ancient Indian iron chisels.

There is not sufficient archaeological evidence to support the view that Indian iron technology was developed indigenously. But until the late 60s, many archaeologists

* Presidential Address read at the XVIIIth Annual Conference of the Indian Society for Prehistoric and Quaternary Studies held at Vivekananda Kendra, Kanyakumari, Tamil Nadu, 11-13 November 1990.

believed that Indian iron technology was received, like the copper and bronze technologies, readymade from Iran. For example, the Allchins expressed the view (1968) that the smelting of iron was first developed in Asia Minor, and between 1800 and 1200 B.C. it remained a monopoly of the Hittites. The breakdown of the Hittite Empire in 1200 B.C. provided the necessary stimulus for the diffusion of iron technology towards the east as well as the west. Lallanji Gopal (1960) was of the opinion that it was the Aryans who introduced iron technology into India. Banerjee (1965) observed that it was the Painted Gray Ware people who introduced iron technology into India, however, at Noh and Jodhpur, iron objects preceded the PGW levels (IAR 1963-64, 1972-73).

Iron technology developed in India on the basis of a long tradition of successful copper technology which provided the necessary infrastructure for mining, roasting, crushing of the ore and beneficiation and smelting in small furnaces. However, more than three hundred years were to pass before the experiments proved successful and the long trial period can be ascribed to the following. First of all, the affinity of oxygen to iron is stronger than that of copper to oxygen. Secondly, iron ore is associated with more gangue material than copper ore. Thirdly, when iron is smelted in a small simple furnace it is difficult to maintain the reducing atmosphere at a high temperature. The minimum temperature necessary for smelting iron is 1150° to 1200° Celsius. To maintain this high temperature in the furnace a good supply of oxygen is necessary, but simultaneously there should be a strong reducing atmosphere within the furnace charged with an excess of carbon monoxide. It is no wonder that it took such a long time for the iron smelters to balance these conflicting demands within the furnace before they were able to produce a pasty, semi-fused, spongy mass of iron. However, to render this spongy mass of iron useful for making weapons and implements, it needed to be further treated. First of all, the extracted sponge iron was full of non-metallic inclusions which had to be ejected. This was done by hammering the red hot sponge iron on an anvil. When it was hammered, sparks flew in all directions and it was only when the sparks ceased that the smith knew the metal had become homogeneous but still remained soft. It did not produce hard, strong and enduring cutting edges. To produce hardened strong metal with sufficient tensile strength it was necessary to include small amounts of carbon in the metal to convert it into steel. As little as 0.2 to 0.3 percent of carbon converted wrought iron into hard, strong steel. In the early stages, this was done by heating the metal on a bed of charcoal and beating it into a sheet. The sheet was again heated on charcoal and folded, and the fold forgewelded together by hammering. This process of folding and welding was done repeatedly to strengthen the metal. The smith may not have known what was happening to the iron, but over a period of time he understood that this laborious process rendered the sponge iron hard and strong

and suitable for making implements and weapons.

When carbon is incorporated into wrought iron a lot of changes take place:

1. At room temperature the atoms of iron are arranged in a body-centred cubic lattice pattern. When iron is heated to 906° Celsius iron atoms spontaneously rearrange themselves into a face-centred cubic lattice pattern.
2. Hardly any carbon can exist in solid solution in the body-centred lattice pattern. But at high temperatures, in a face-centred cubic lattice pattern, up to 1.7% carbon can exist in solid solution in iron to form high carbon steel.
3. When steel is allowed to cool, carbon does not come out of the solid solution. Instead, carbon remains in iron as iron carbide. It is the presence of iron carbide that confers increased hardness to the metal.

Iron carbide is known as cementite. Iron and cementite are distributed in steel in layers. The iron layer is known as ferrite. The ferrite layers impart malleability to steel. The layered structure of steel is known as pearlite because, when viewed under the microscope with oblique lighting, steel appears iridescent like mother-of-pearl. Steel when heated to a high temperature and quenched becomes hard and brittle. But if it is subsequently heated again to a low temperature, and cooled slowly, it becomes tempered and the metal shows toughness and springiness. These two qualities make steel a very valuable metal. No wonder it took more than three hundred years of experimentation for Indian smiths to learn all these aspects of the metal. It is important to note here that the ancient Indian iron smelters and smiths kept up their experiments. Steel objects were made in ancient India by case-hardening and by crucible steel. Case-hardened iron objects of ancient India were brought to light, for the first time, through a study of iron objects recovered from the excavation at Dhatwa, Gujarat. I called this study "A Model for Understanding Ancient Indian Iron Metallurgy" (Hegde 1973). Not many ancient Indian iron objects made from crucible steel have come to light so far. This is due to inadequate work on these objects. Even the iron objects recovered from Megalithic burials studied by one of my students have shown that they were made from smith-welded strips of case-hardened carburised iron (Mudhol 1989). The amount of carbon absorbed by iron in these objects naturally depended upon the extent of repeated heating and forging. Often these objects are found to include 0.2 to 0.3% carbon. Rarely, however, is a carbon content of 0.7% found. Producing such case-hardened iron is extremely laborious. Therefore, the hardness, strength, enduring keenness and sharpness of ancient Indian iron tools were entirely due to the skill, perseverance, painstaking and prolonged labour and the strong biceps of the ancient Indian blacksmiths.

Carbonized iron objects and wootz steel were continuously produced in ancient India to meet the indigenous demand and also for export. As a testimony to the continued excellence of iron technology in India, one may cite the example of the 4th century A.D. massive iron pillar at Mehrauli near Delhi. The pillar measures 7.5 m in height, 1.5 m in circumference near the base and weighs more than 6000 kg. An inscription near its base attests to its production in the 4th century A.D.. The pillar was built up by smith-welding, one above the other, over 200 solid cylindrical lumps of very high quality wrought iron. Its chemical analysis has indicated that it is composed of 99.72% iron, 0.08% carbon, 0.046% silicon and 0.006% sulfur. The pillar has been exposed to the elements for 1,600 years. Nevertheless, except for a thin oxide film on its surface, it is free from the formation of heavy rust. Three factors appear to have contributed to its exceptional ability to withstand the forces of corrosion. They are: (1) the absence of sulfur and chlorine compounds in the atmosphere to which it has been exposed; (2) the absence of appreciable amounts of sulfur in the composition of the metal and (3) compressional stress left in the metal by hammering when the pillar was originally produced. This iron pillar is a monument to the advanced level of iron metallurgy attained in ancient India.

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Planned Cooperation Between Archaeologists and Scholars of Ancient Literature — A Crying Need*

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Abstract

This paper lays emphasis on the importance of and necessity for close cooperation between archaeologists and scholars of ancient literature to achieve a better understanding of India's past. The author gives examples from the excavations of Hastināpura, Kausāmbi, Śrngaverapura and Śisupālgarh and demonstrates how archaeological findings from these sites acquire a new and fuller meaning when they are seen against the background of descriptions in the Brāhmaṇas, Epics, Purāṇas and Kautilya's *Arthaśāstra*. The author also makes a plea for renewed excavations at the site of Śisupālgarh to find out how the criteria given in the *Arthaśāstra* for the planning of a capital were followed at this site and to demonstrate the value of planning field work on the basis of the data obtained from literary sources.

Whenever I think of the late Prof. H.D. Sankalia to whose memory this lecture is dedicated, I cannot but think of the Deccan College Department of Archaeology which he nurtured all along as his child and of the Deccan College itself of which he was a distinguished Director. With these initial thoughts, a picture begins to appear before my mind's eye of Pune as a great seat of learning, since it has produced many academic giants, some of whom are still living. Between them, the Deccan College and the Bhandarkar Oriental Research Institute (with its present distinguished Director, Prof. R.N. Dandekar) have held the academic flag so high that few other cities can boast of such eminence. Both these institutions are devoted to the unravelling of India's past, the former through archaeology and the latter through literature. What has, however, intrigued me most is that these institutions have not pooled their resources with a view to producing an authentic picture of the country from, for example, the Vedic period when we have our first encounter with literary data, right up to the Early Historic period — a span of about two to three millennia, for which the picture, it must be admitted, is still rather hazy. The time has come — indeed, it has long been overdue — for such coordination, since not much further headway can be made in arriving at widely acceptable solutions to many of the problems relating to the aforesaid period either by scholars of ancient literature or by archaeologists, working each to

the exclusion of the other. While a detailed plan for coordination can be arrived at through a mutual dialogue, what is needed first is a willingness on both the sides to come closer to each other. In such an effort, it must be clearly understood that neither party would join hands with the other with a sense of superiority. They should meet as equals, willing, nay even self-effacing, partners in a holy and sacred mission, namely that of ascertaining the truth irrespective of whether the truth arrived at in such a manner fits into our preconceived notions or completely shatters them. Truth and truth alone must be our objective.

The reason why I have chosen this topic is that my own modest contribution has convinced me that quite often archaeological data cannot always be clearly understood or interpreted in isolation. It is only when the data are projected against the literary background that a sensible picture begins to emerge. However, as my own knowledge of archaeology as well as ancient literature is very limited this "two-in-one" exercise will not work. To achieve results on a broader basis, encompassing a wider panorama of both time and space, collaborative efforts not by one but many teams are necessary, since the problems are so many and so varied. If this brief talk today can excite or shall I say incite even a few archaeologists and scholars of ancient literature to break away from their self-imposed isolation and come together

* The first Professor H.D. Sankalia Memorial Lecture delivered under the auspices of the Indian Society for Prehistoric and Quaternary Studies at the XVIIIth Annual Conference of the Society held at Vivekananda Kendra, Kanyakumari, Tamil Nadu, 11-13 November 1990.

with a view to future collaboration, I will be satisfied that this talk has fulfilled its purpose.

Though some of my writings have already been published, they occur in a currently fashionable category of publications — Felicitation Volumes. These volumes tend to reach only the contributors or the shelves of select libraries. Hence most scholars do not have a chance to know what has appeared and where. It is, thus, likely that what I am going to re-state here from some of my papers, published or about-to-be published in such volumes, may not have come to the notice of many in the audience. However, if it has, I will request the persons concerned to bear with me for this repetition since it is only through citing certain examples that I can stress the point I wish to make, viz. why it is necessary to synthesize archaeological evidence with that from literature.

My first example relates to an intriguing phenomenon about the sizes of kiln-fired bricks used in a tank. As a part of my recent project: 'Archaeology of the Rāmāyaṇa Sites',

I carried out excavations at Śrngaverapura, District Allahabad, Uttar Pradesh, where according to the Rāmāyaṇa of Vālmīki, Rāma crossed the Gangā during the period of his exile from Ayodhyā. Stratigraphic evidence shows that the first occupation here began towards the close of the second millennium B.C. represented by the pottery called Ochre Coloured Ware. The site was, however, soon abandoned. The second phase commenced some time in the tenth century B.C., represented by Black-slipped, Black-and-Red and Burnished Gray wares. During the first as well as the second periods, the habitation was close to the river. However, around c. 700 B.C., with the beginning of the Northern Black Polished Ware period the size of the settlement began to increase and by the Sunga period, i.e. the second century B.C. it had grown so much that some parts of it were at a distance of half-a-kilometre or more from the river. This appears to have created a serious problem of water supply and the authorities concerned tried to solve it by constructing a brick-lined tank, fed by the waters of the Gangā through a specially excavated channel. With its elaborate arrangements

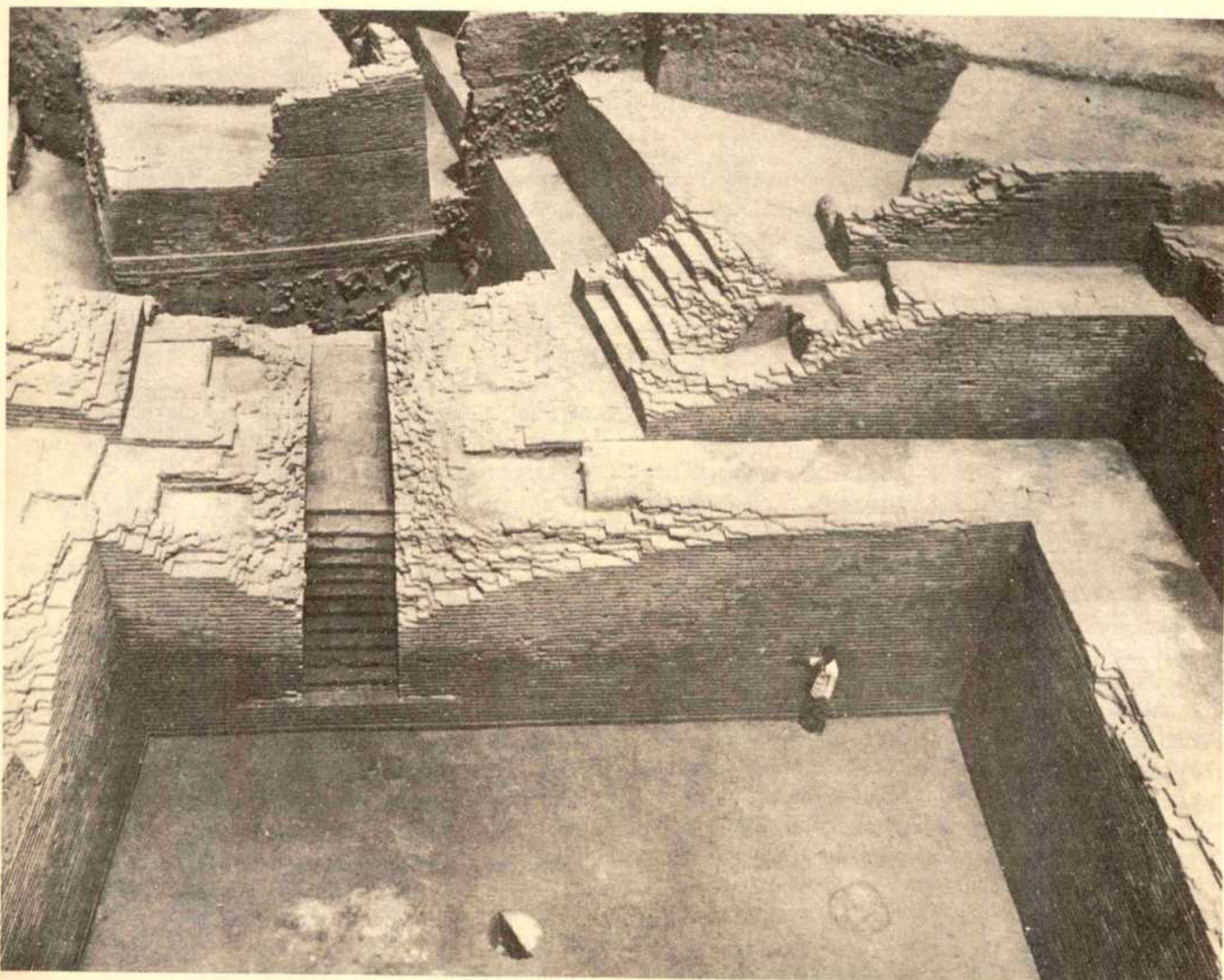


Fig. 2: Śrngaverapura: A view of the northern part of Tank B

— such as the provision of a silting chamber, a siltation tank, the main tank, a subsidiary tank, waste weir and finally an exit channel — this complex is an unique example of Indian hydraulic engineering 2000 years ago (Fig. 1).

Of this complex, the brick-lined portion alone is nearly 250 m in length. There are three retaining walls, erected in a terraced form, one behind the other, to a total height of 7.15 m (Figs. 2 and 3). In the construction of these brick walls billions of bricks appear to have been used.

But the intriguing point about these bricks is that while they may be regarded 'by courtesy' to have a 'standard' size, all of them do not have exactly the same measurements. Some are of one size, others of a somewhat different size, and still others of a third size and so on ($42 \times 27.5 \times 6.5$ cm or $44 \times 28 \times 6.5$ cm or $42 \times 28 \times 6$ cm, etc.). At the same time, it can be seen that the *inter se* difference is not very great. Taking into account the two extremes, the length varied between 41.5 and 44 cm, the width between 27 and 28.5 cm and the thickness between 5.5 and 7 cm. Thus, while there appears to have been some concept of standardisation, the standard itself was not strictly imposed, such as that which existed for example, during the Indus Valley period when it was so rigid as to have been either $30 \times 15 \times 7.5$ cm in the case of house bricks or $40 \times 20 \times 10$ cm in the case of bricks used in fortifications or large podia/platforms.

This raises the question of why there was any size variation, even though not very significant. Before we



Fig. 3: Śrngaverapura: A view of the eastern part of Tank B

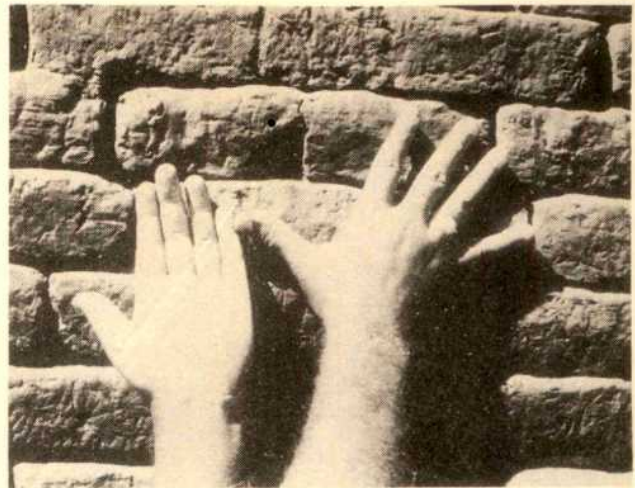


Fig. 4: Śrngaverapura: Close-up of bricks used in the lowest revetment of Tank A. These measure one *vitasti* (span) and four *angulas* (finger-widths) in length.

proceed further, let me bring a particular fact to your notice. Whereas graduated scales did exist during the Indus Valley period, no such scales have been found assignable to Early Historical times. At least I am not aware of any such scale. (If anyone in the audience has come across one, I would be most grateful for the information).

How then were these bricks measured during the Early Historical period.¹ In my search for an answer I referred to ancient texts and found that it was the human body that provided the basis for measurements. Thus, for example, the *Śatapatha Brāhmaṇa*, usually assigned to c. 8th century B.C. indicates that the cubit or forearm, foot and even the thigh bone were used as 'standards' for measuring bricks.

"Athāta ishṭakāmātrāṇāmeya. Pāda
matriḥ prathamāyām chottamāyām cha
chityorupadadhyātpratishṭhā vai pado yo vai
pādaḥ sa hasta urvasthamātryo
varshishṭhāḥ syuḥ..." (*Śatapatha Brāhmaṇa*,
Kāṇḍa 8, Adhyāya 7, Brāhmaṇa, Kaṇḍikā 17).

However, a much more elaborate scheme of measurements is given in the *Arthasāstra* of Kautilya, a work dated to the 4th century B.C. Relevant parts of it are quoted below (Shamasastri 1960: 117):

8 atoms (<i>pramāṇavaḥ</i>) are equal to	1 particle thrown off by the wheel of a chariot
8 particles are equal to	1 <i>likshā</i>
8 <i>likshās</i> are equal to	the middle of a <i>yūka</i> or a <i>yūka</i> of medium size
8 <i>yūkas</i> are equal to	1 <i>yava</i> (grain of barley) of middle size

1. It is not in the Śrngaverapura tank alone that the aforesaid variation in brick sizes occurs. This feature is met with in bricks all over the country belonging to the Early Historical period.

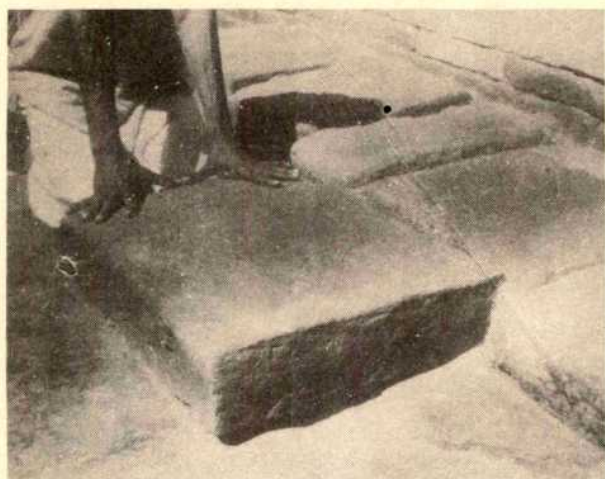


Fig. 5: Śrngaverapura: Bricks used in the floor of Tank A. These measure two *vitastis* (spans) in width, two *vitastis* and eight *angulas* (finger-widths) in length and six *angulas* in thickness.

8 <i>yavas</i> are equal to	1 <i>angula</i> = the middle joint of the middle finger of a man of medium size
4 <i>angulas</i> are equal to	1 <i>dhanurgraha</i>
8 <i>angulas</i> are equal to	1 <i>dhanurmushṭi</i>
12 <i>angulas</i> are equal to	1 <i>vitasti</i> or <i>chhāyāpaurusha</i>
14 <i>angulas</i> (<i>Paramāṇvaḥ</i>) are equal to	1 <i>śama</i> , <i>sala</i> , <i>pariraya</i> , or <i>pada</i>
2 <i>vitastis</i> are equal to	1 <i>aranti</i> or 1 <i>prājāpatya hasta</i>
2 <i>vitastis</i> plus 1 <i>dhanurgraha</i> are equal to	1 <i>hasta</i> used in measuring balance and cubic measures and pasture lands
2 <i>vitastis</i> plus 1 <i>dhanurmushṭi</i> are equal to	1 <i>kishku</i> or 1 <i>kamsa</i>

Though the above mentioned series is quite a detailed one, the question that arises again is: was there any 'absoluteness' about these units in terms of our present day measurements e.g. centimetres and metres or inches and feet? The very fact that an *angula* has been defined as mentioned above makes the system very flexible and not absolute. To test this hypothesis, I took the measurements of the *dhanurgraha* (4 *angula* unit), the *vitasti* (span), and *hasta* (cubit) of a large number of labourers working with us at Śrngaverapura. A dozen of these measurements are recorded in Table 1. It can be seen that the measurements vary from person to person, the 4 *angula* unit ranging from 6.5 to 7.9 cm, the *vitasti* from 18 to 24 cm, and the *hasta* from 42.0 to 48.2 cm. Even if we disregard those measurements which are either extremely low or high, we still do not have any uniformity. The narrower range would still be from 7.2. to 7.9 cm for the 4 *angula* unit, from 20.5 to 22.2 cm for the *vitasti* and from 43.6 to 46.4 for the *hasta*. Clearly therefore in no two cases are all the above mentioned units alike.

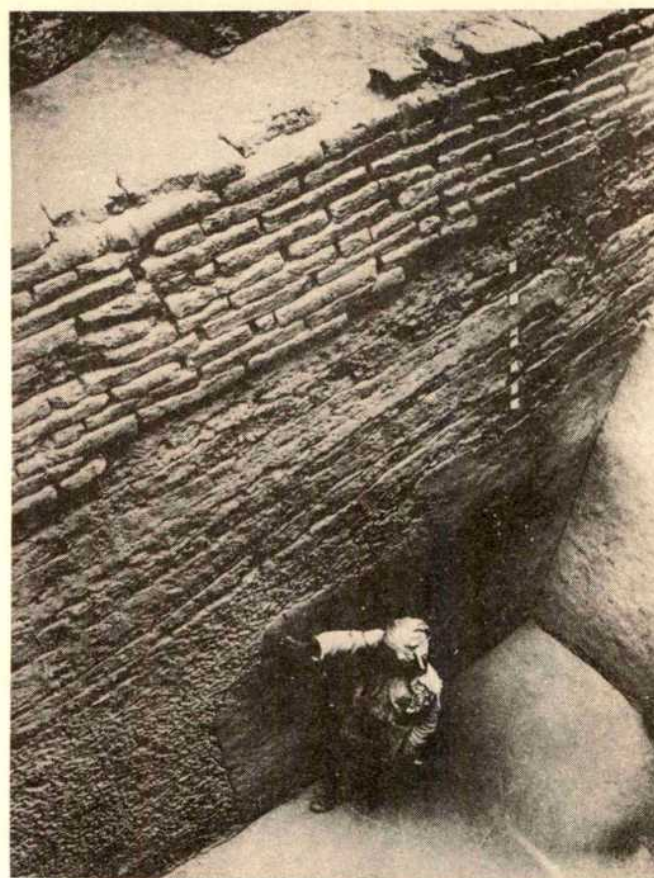


Fig. 6: Hastināpura: The eastern part of the Painted Gray Ware settlement was cut away by a flood in the Gangā. The man points to the erosional scar left by the river.

If we now revert to the question of the sizes of bricks used in the Śrngaverapura tank, we would perhaps be nearer the answer. As indicated earlier, billions of bricks had been used in the construction of the tank. It is obvious that no single person, no matter how resourceful, could have manufactured all these bricks. Clearly, therefore, a large



Fig. 7: Hastināpura: Layers of sand and clay that accumulated near the erosion line.

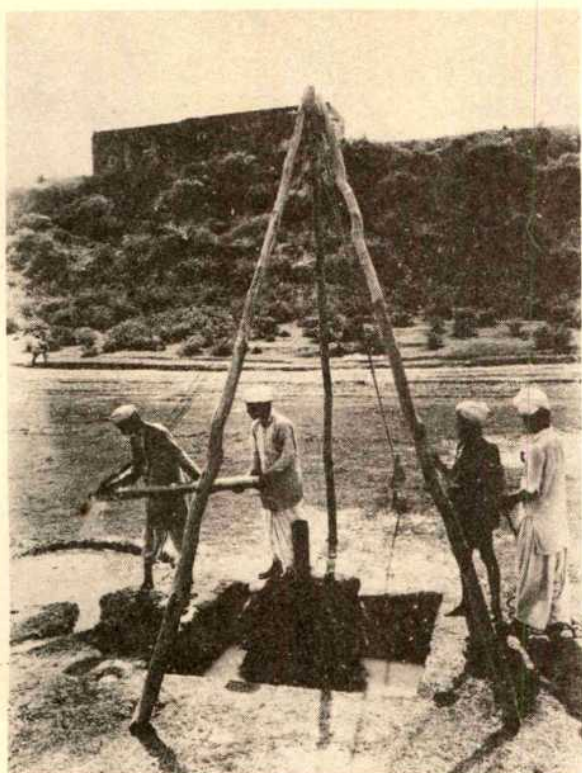


Fig. 8: Hastināpura: One of the borings in the bed of the Gangā. Herein the material washed away during the flood was met with some 15 m below the sub-soil water level.

number of persons — contractors, sub-contractors, craftsman — were at work. Assuming that whoever had authorized the construction of the tank wanted the bricks to be *x angulas* in thickness, *y angulas* plus one *vitasti* in width, and *z angulas* plus one *vitasti* in length, and placed orders accordingly with the suppliers of the bricks, each manufacturer would apply his own 'standard' of *angulas*, *vitasti*, *hasta*, etc. in the actual execution. This would naturally result in minor variations in the size of the bricks in terms of our modern measurements, although as far as the ancients were concerned, these were still 'standard' bricks since they conformed to the order placed.

To test whether the bricks used in the Śrngaverapura tank were really manufactured in terms of the *angulas*, *vitasti*, *hasta*, etc. I asked some of the labourers to measure their forearms, feet, etc. against the bricks and we were pleasantly surprised to find that they did tally, as can be seen in Figs. 4 and 5.

The foregoing discussion demonstrates the fact that had I not drawn upon the literary evidence regarding the mode of measurements in ancient times, the minor variations observed in the sizes of the bricks of the Śrngaverapura tank — or for that matter, of the Early Historical period as a whole — would have remained an enigma.

Let us consider another example where literary evidence provided an explanation for a strange phenomenon

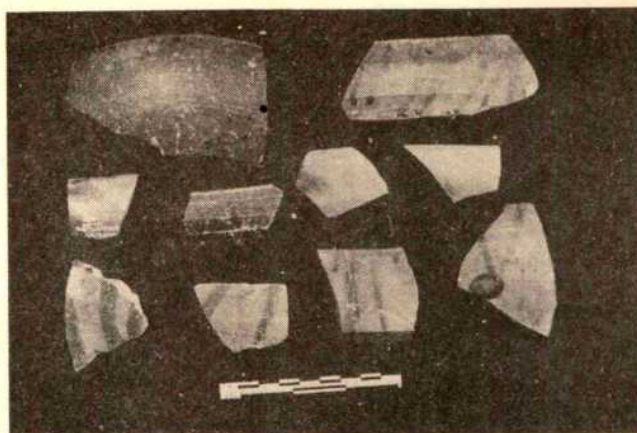


Fig. 9. Kauśāmbī: Sherds of Painted Gray Ware found in the lowest levels of the site

noticed in the course of the excavation at Hastināpura, a site associated with the Mahābhārata. Although the report was published about thirtyfive years ago (Lal 1955), the point at issue is still relevant in the present context.

The mound of Hastināpura is located on the right bank of the Gangā in the Meerut district of Uttar Pradesh. During the course of the excavation we noticed that the strata yielding the Painted Gray Ware culture were conspicuously absent from the riverside section of the mound, although the same occurred in abundance over the rest of the area. The subsequent Northern Black Polished Ware strata were, however, present throughout the mound, inclusive of the riverside area. This intrigued me very much and I often discussed this erratic behaviour of the Painted Gray Ware deposits with my colleagues but to no avail. One night it occurred to me that it was possible that during the course of a heavy flood the river may have cut into and washed away a part of the mound as a result of which the Painted Gray Ware strata on the riverfront might have disappeared. It was 2 a.m.. I woke some of my colleagues and told them about my conjecture, adding that we could go up the mound and examine the rain gullies nearer the riverfront to ascertain if my hypothesis had any basis. They readily agreed to accompany me, for, might I add here, we formed a very well-knit team. A few chowkidars were summoned, petromaxes were lit and picks, shovels and knives collected. A thorough search was carried out for nearly two hours, examining one rain gully after another. Luckily, we came across a partially exposed section of the mound where we observed that the Painted Gray Ware strata occurred on one side, but not on the other. This gave us immense satisfaction. The next morning we extended the long trench already laid out atop the mound to cover the aforesaid area and within a fortnight we reached the level where we clearly encountered the erosion line (Fig. 6). Further towards the river we came across the material which had been washed away and was lying about higgledy-piggledy, and over this were bands of sand and clay signifying desertion (Fig. 7). This confirmed

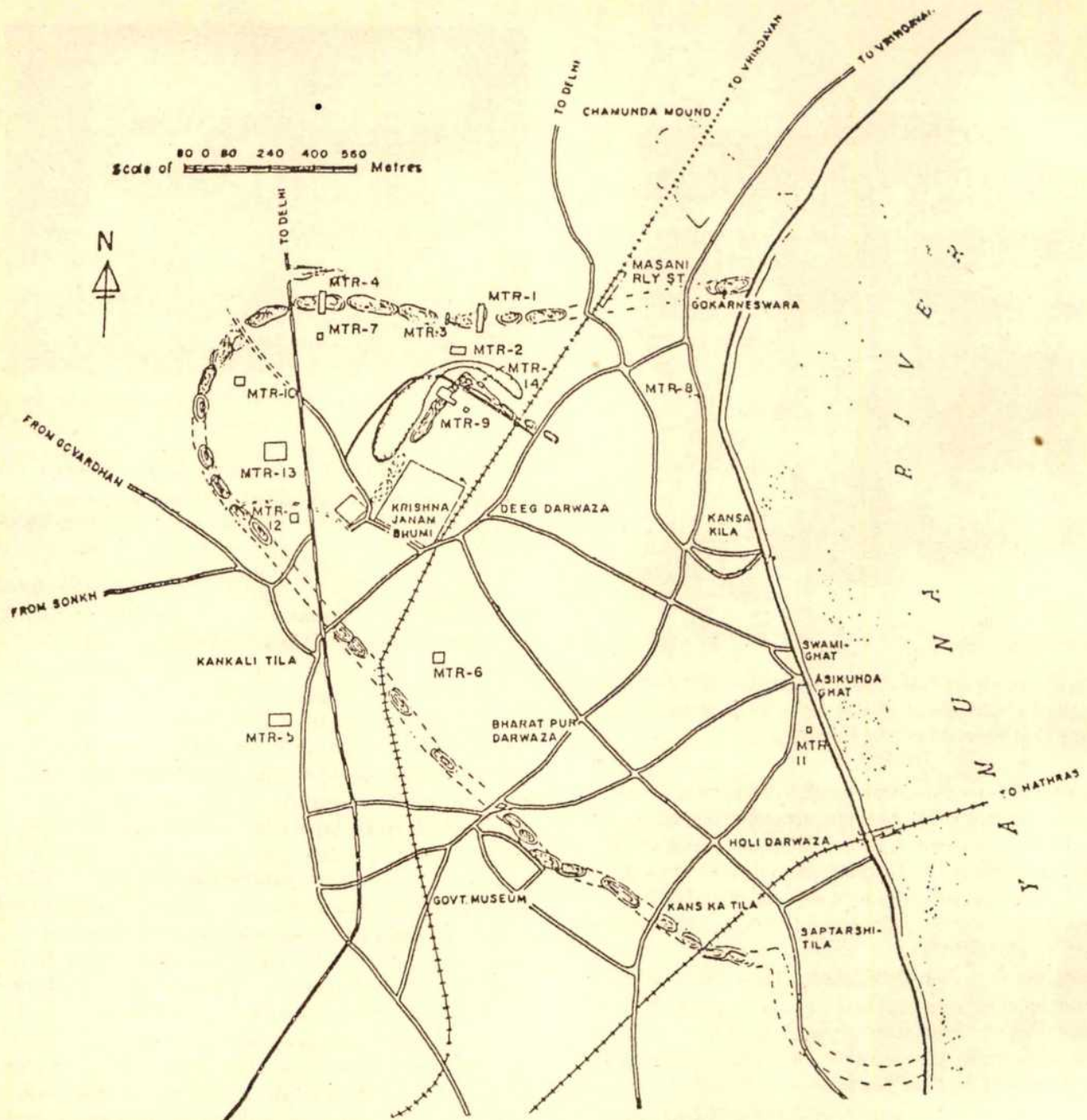


Fig. 10: Mathurā: Plan showing ancient fortification

my guess that it must have been a heavy flood in the river that was responsible for washing away the Painted Gray Ware strata on the riverside.

But the matter did not end there. We decided to carry out borings in the adjacent river bed in the hope of obtaining further evidence about the flood episode. And there, some 15 m below the water level in some of the borings we encountered a part of the material that had been carried away by the river (Fig. 8). The guess was no longer a guess, but a fact.

However, I was unable to understand the significance of this in terms of the history of the area until I looked up the relevant texts. The *Purāṇas* say that after the Mahābhārata war, Parikshit came to the throne. Fifth in succession after him was Nichakshu during whose reign a great flood occurred in the Gangā, and washed away a part of Hastināpura and, as a result, the capital was shifted to Kauśāmbi.

*Gangāyāpahṛte tasmin nagare Nāgasāhvaye
Tyaktvā Nichakshur-nagaram Kauśāmbiyā sa nivastyati*
(Pargiter 1913: 5 and 65).

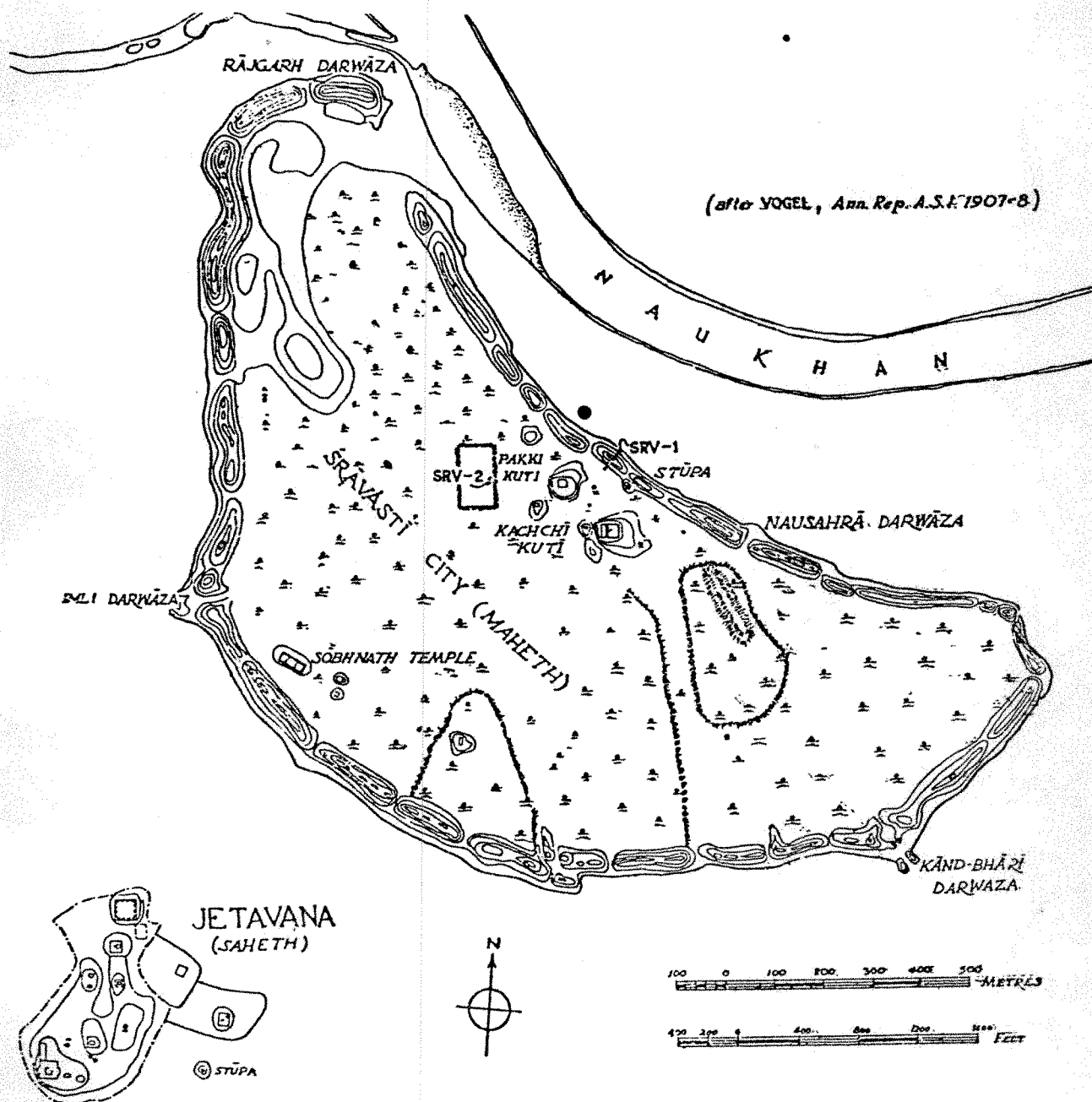


Fig. 11: Śrāvastī (Saheth-Maheth): Site plan (after Vogel, Ann. Rep. A.S.I. 1907-8)

While the first part of this text bore testimony to the flood havoc at Hastināpura, what about the second part, the shifting of the capital to Kausāmbī. Here again, the literary evidence makes the archaeological evidence meaningful. In the lowest levels of the excavation at Kausāmbī sherds of the Painted Gray Ware do occur (Fig. 9). These, though not as rich as those at the peak period, are clearly genetically

connected with the same. Thus there is a clear case of continuity from the late Painted Gray Ware levels of Hastināpura to the Painted Gray Ware-bearing strata at Kausāmbī. The shifting of the capital from Hastināpura to Kausāmbī need not, therefore, be a figment of imagination; it may have a kernel of truth. However, if we are looking for inscriptions which will tell us 'here is Hastināpura where the Kauravas

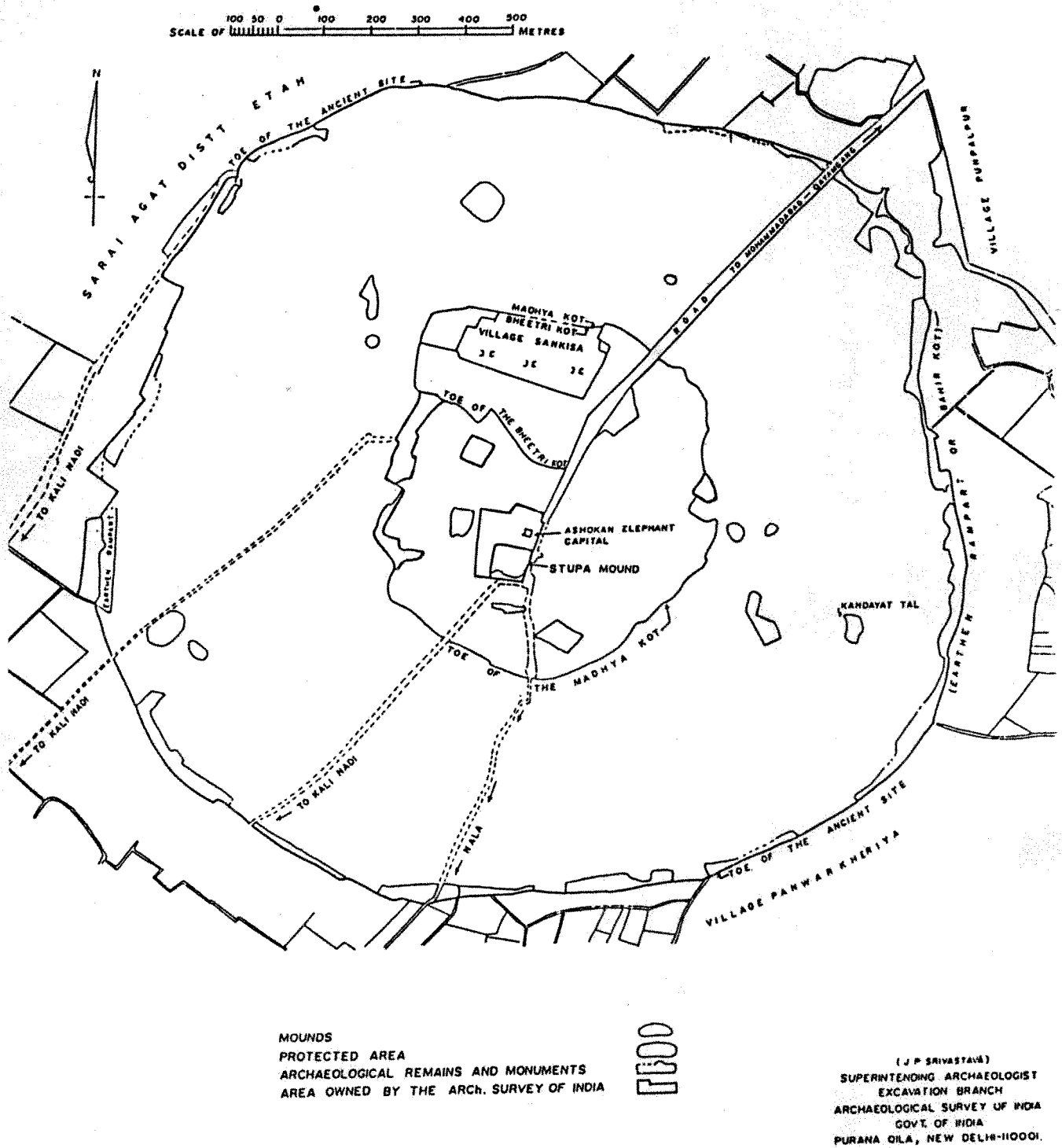


Fig. 12: Sankisa: Site plan

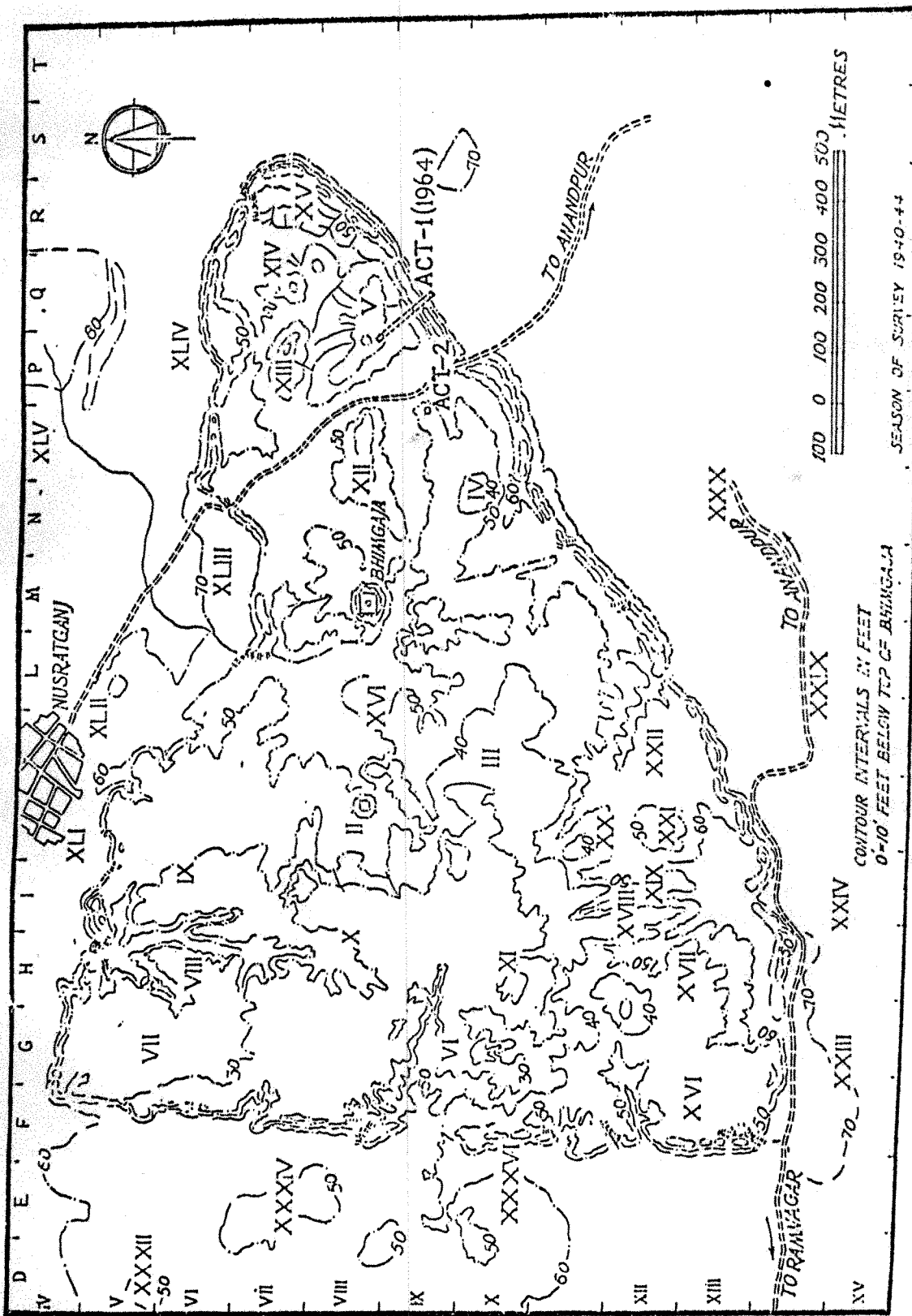


Fig. 13: Ahichchhatra: Site plan

ruled' or 'here is Kauśāmbī where Nichakshu shifted his capital' archaeology will never oblige us, since, unfortunately, at that point of time writing was unknown in the Gangā Valley. Of the hundreds of sites explored in the Valley thus far, none has yielded any inscriptions which can be ascribed to a period prior to the 4th century B.C.

This example yet again substantiates my contention that the archaeological data would not have made sense without the supporting literary evidence. I shall now make a plea for the application of the data obtained from literary sources to the planning of archaeological field work, and illustrate the same.

Ancient texts mention various settlements and describe a variety of town plans. For example, the *Samāraṅgaṇa Sūtradhāra* states that a town with the plan of a bow is firmly established: *Chāpakāre pure loke nivasan bhavati dhruvam* (p. 44, line 122). Likewise, the *Matsya Purāṇa* showers praise on a town resembling a half-moon in plan: *ardhachandram praśānsanti nadītīreshu tadvasan* (Chap. 217, line 27). Even specific cities have been referred to as having this kind of plan. For example, while referring to Mathurā, the *Harivamśa* says: *ardhachandra pratikāśa Yamunā tīrasobhitā* (Chap. 1, line 54). Actual surveys (Fig. 10) have shown that Mathurā does have a half-moon-like plan (Joshi 1989, Fig. 18.1). Śrāvastī, in Gonda Bahraich District, Uttar Pradesh (Fig. 11), also follows a similar plan (Sinha 1967, Fig. 1).

Then there are circular cities, as mentioned, for example, again in the *Matsya Purāṇa* (Chap. 217, line 24). The site of Sankisā, ancient Sānkasya, located in Farrukhabad District, Uttar Pradesh is a very good example of this type (Fig. 12)².

Texts refer to cities with a triangular plan e.g. *tryasram trisakti nāsāya* (*Yuktikalpataru*: 23). Though it appears to be a somewhat odd outline for a city, we do have one in actuality, viz. Ahichchhatrā, District Bareilly, Uttar Pradesh (Fig. 13), (*JAR* 1964-65: 40).

Rectangular plans appear to have been common according to the texts. For example, the *Matsya Purāṇa* states: *Āyatam vā kārayet puram* (Chap. 217, line 24). The *Brahmaṇḍa Purāṇa* speaks in the same vein: *Āyatam divyam praśastam taiḥ puram kṛtam* (Chap. 7, line 216). Archaeology has brought to light a few sites with rectangular plans, e.g. Vaiśālī (Fig. 14), District Muzaffarnagar, Bihar (Deva and Misra 1961: 4).

However, the most applauded plan seems to have been the square one. For example, the *Yuktikalpataru* says: *Chaturasram chaturvarga phalāya prthivīpate* (p. 23), implying thereby that a square township confers all the four boons, viz. *artha*, *dharma*, *kāma* and *moksha*. In a way this

is quite accurate because a square plan is the most manageable of all, more particularly where the layout of houses, streets, fortifications, gateways and even ditches around the fortifications are concerned.

I will now describe certain details of a square township as revealed by my excavations, compare these with similar details in an ancient text and then suggest how future work at the site concerned should be planned so as to verify some of the other statements given in the text. The site is Śisūpālgarh, District Bhubaneswar, Orissa, and the text is none other than the *Arthasāstra* of Kautilya. There is one more point about this comparative study that I should stress. Whereas, in the case of Mathurā, Śrāvastī, Sankisā, etc. mentioned earlier, the texts were not contemporary with the sites concerned, in the case of Śisūpālgarh, however, which goes back to the 4-5th century B.C.³ there is close contemporaneity between it and the *Arthasāstra* which, may have been a work of the 4th century B.C.

Let me first very briefly recount the outcome of the excavations at Śisūpālgarh, which I carried out as far back as 1948 (Lal 1949). The second season's work unfortunately remains unpublished, but I will include some important discoveries made during this season as well.

Located close to Bhubaneswar, the site of Śisūpālgarh forms a square on plan, each side measuring 1.2 km. The overall orientation is along the cardinal points. Around the township there runs a fortification wall which, in turn, is girdled by a moat fed by a perennial stream (Fig. 15). The fortification wall consists of an earthen rampart over which rests a wide wall with an earthen core but with facings of kiln-fired bricks. Piercing the fortifications there are two gateways on each side in these walls, along with a number of minor gateways, whose exact number still remains to be ascertained. Excavation of one of the main gateways, in the northern part of the western fortification wall, revealed a very elaborate plan, with an ancillary passage and a guard-room (Fig. 16). The lower part of the gateway flanks were made of large stone blocks, over which rested a superstructure of kiln-fired bricks. Access to these upper parts was by means of two staircases, one on each side. Tracks left by the vehicular traffic that passed through this gate were also identified (Fig. 17).

The two major gates are located opposite each other (Fig. 15). The excavation of an area to the east of the gateway located along the alignment between the two opposed gates, brought to light a stone-paved road with houses on either side (Figs. 18 and 19). In the central part of the site are located a series of pillars (Fig. 20). This pillared area was not excavated, but on stylistic grounds the pillars

2. Courtesy Shri J.P. Srivastava, Superintending Archaeologist, Archaeological Survey of India.

3. The dating given in my report on Śisūpālgarh (*Ancient India* 9: 62-105) was on the conservative side. In view of the evidence now available about the Black-and-Red Ware, some rethinking on this date seems to be called for.

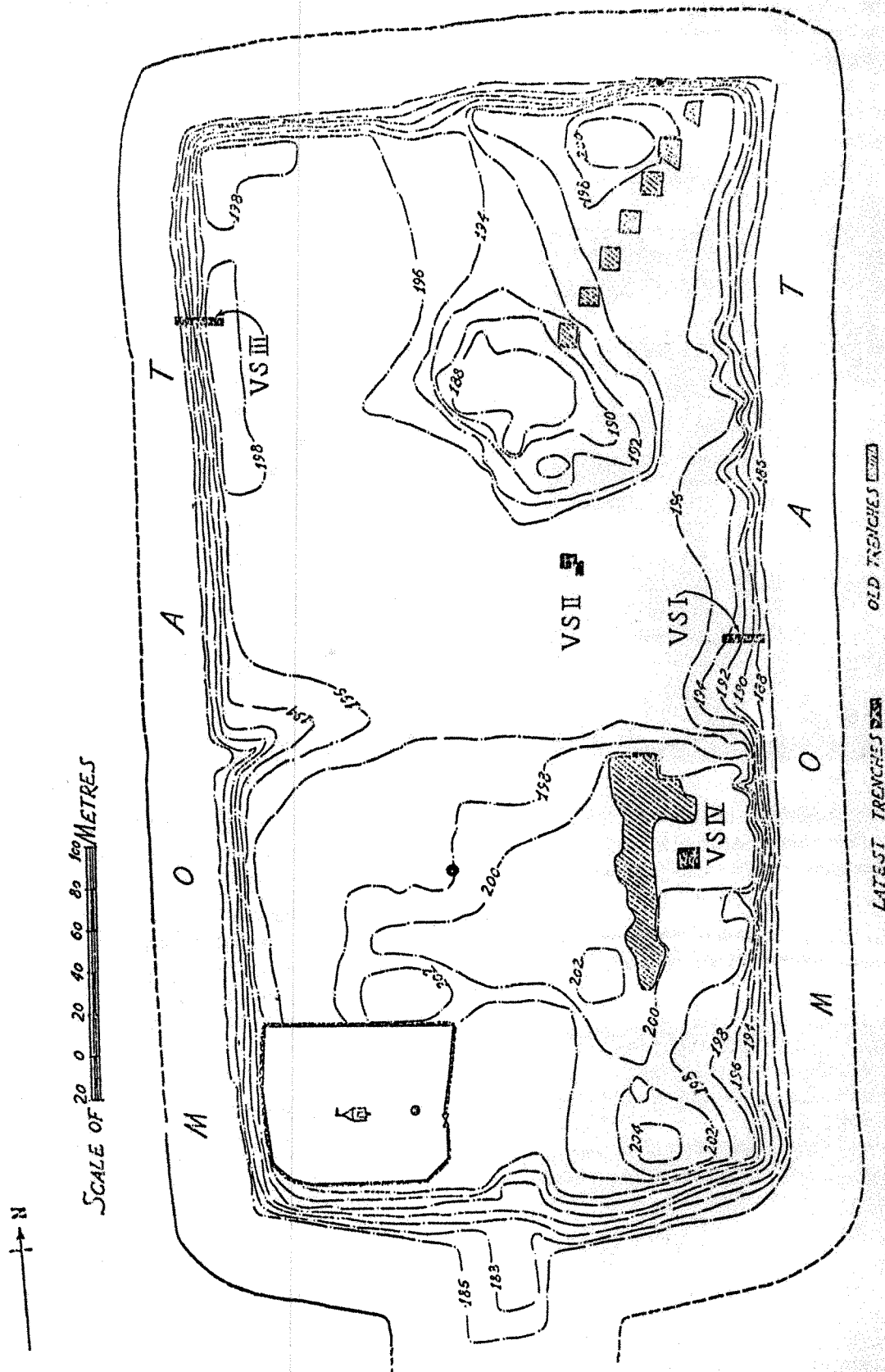


Fig. 14: Vaisali: Site plan

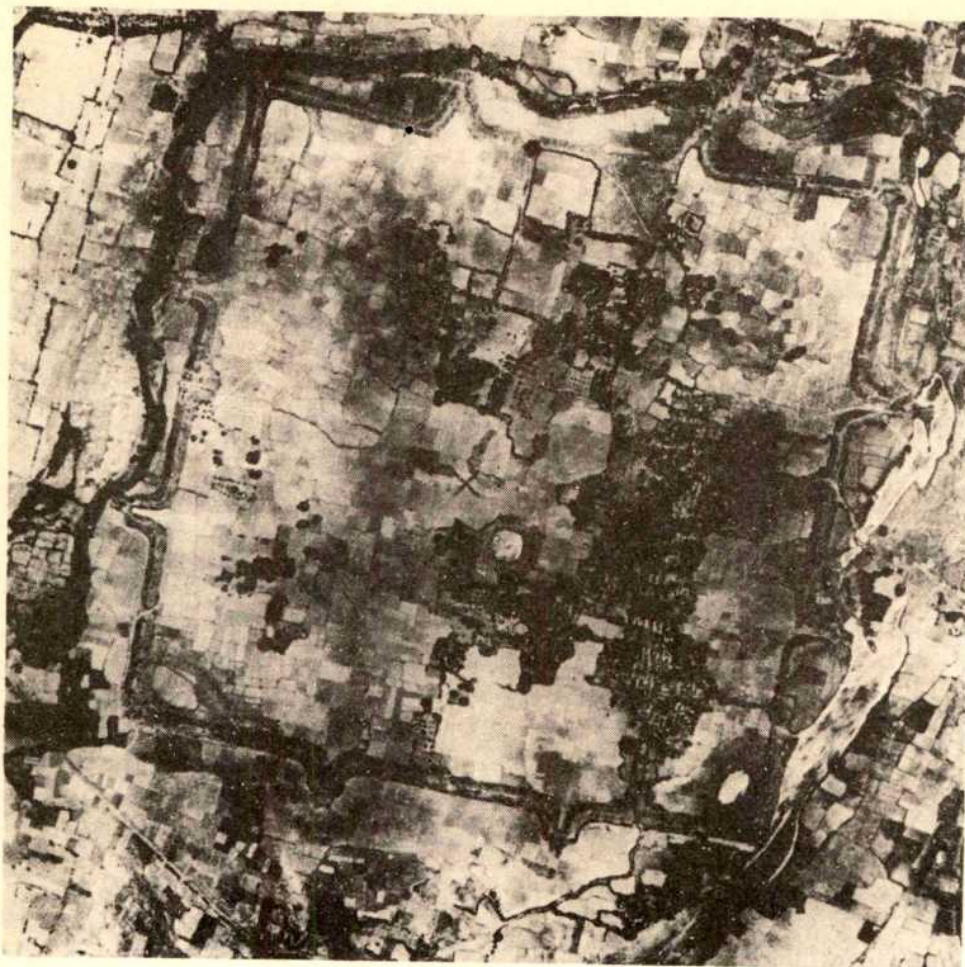


Fig. 15: Śisupālgarh: Aerial view of the site, showing the fortification wall, gateways and moat

appear to belong to Early Historical times. It has been surmised that these pillars may have formed part of an assembly hall or similar edifice associated with a palace complex.

With this brief description of the site we may now pass on to relevant descriptions of fortified towns as given in the



Fig. 16: Śisupālgarh: General view of the northern gateway in the western fortification wall

Arthasāstra. To save space and time, I am not quoting the original Sanskrit text, but am only giving a translation thereof by Shamasastri (1960: 50-55).

"... the king may have his fortified capital (*sthānīya*) as the seat of his... in a locality naturally best fitted for the purpose. Such as the bank of the confluence of the rivers, a deep pool of perennial water or of a lake or a tank, surrounded with an artificial canal of water, and connected with both land and water paths (may be constructed).

"Round this fort, three ditches... filled with perennial flowing water or with water drawn from some other source, and possessing crocodiles and lotus plants shall be constructed.

"At a distance of four *daṇḍas* (24 feet) from the (innermost) ditch, a rampart, six *daṇḍas* high and twice as much broad, shall be erected by heaping mud upwards.⁴

"Above the rampart, parapets in odd or even numbers and with an intermediate space of from 12 to 24 *hastas* from each other shall be built of bricks and raised to a height of twice their breadth.

4. The text uses the expression *khātādvapram kāryet*, implying that it is the earth obtained in the course of digging the ditch that is to be used for the construction of the rampart.

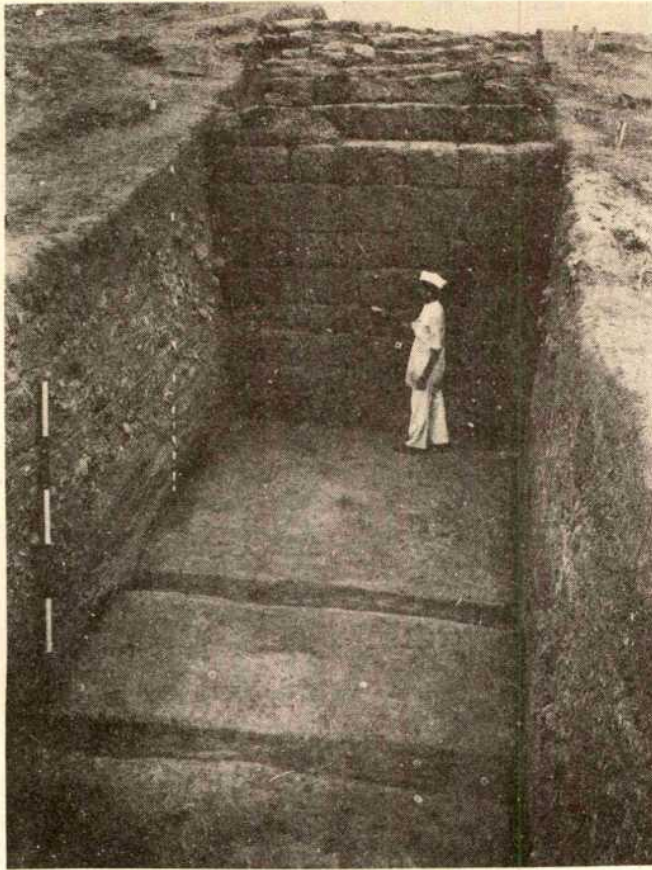


Fig. 17: Śisupālgarh: Cart-tracks in the northern gateway on the western fortification wall

"Having made on both sides the rampart bulge out to the extent of a *daṇḍa*-and-a-half, an entrance gate (to the fort) one-sixth as broad as the width of the street shall be fixed.

"A turret above the gates and starting from the top of the parapet shall be constructed up to three-fourths of its height" (Chap. III).

"Demarcation of the ground inside the fort shall be made first by opening three royal roads from west to east and three from south to north.

"The fort shall contain twelve gates, provided with both a land and a water way and a secret passage.

"Chariot roads, royal roads and roads leading to *drōṇa-mukha*, *sthānīya* country parts, and pasture grounds shall be four *daṇḍas* (24 ft) in width.

"In the midst of the houses of the people of all the four castes and to the north from the centre of the ground inside the fort, the king's palace, facing either the north or the east shall be as described elsewhere (Chap. XX, Book I), be constructed occupying one-ninth of the whole site inside the fort.

"On the eastern side, merchants trading in scents, garlands, grains and liquids, together with expert artisans



Fig. 18: Śisupālgarh: A stone-paved street with houses on both sides

and the people of Kshatriya caste shall have their habitations.

"To the south, the superintendents of the city, of commerce, of manufactories and of the army as well as those who trade in cooked rice, liquor and flesh, besides prostitutes, musicians, and the people of Vaiśya caste shall live.

"To the west, artisans manufacturing worsted threads, cotton threads, bamboo-mats, skins, armours, weapons and gloves, as well as the people of Śūdra caste, shall have their dwellings.

"To the north, the royal tutelary deities of the city, ironsmiths, artisans working on precious stones, as well as Brāhmaṇs shall reside.

"Either to the north or to the east burial or cremation grounds shall be situated; but that of the people of the highest caste shall be to the south (of the city).



Fig. 19: Śisupālgarh: Another view of the same stone-paved street with a major house complex in the foreground

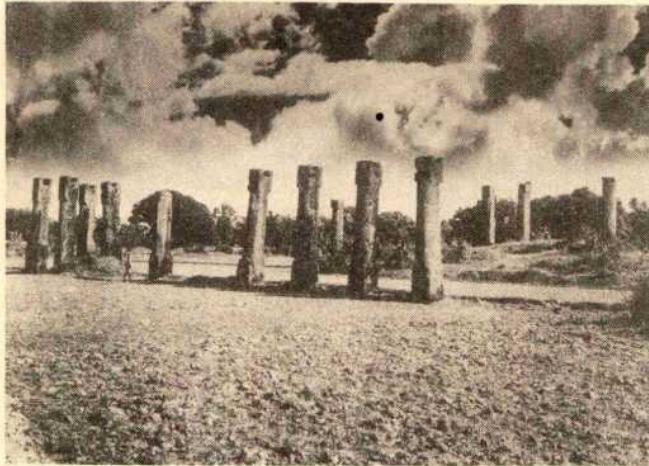


Fig. 20: Śiśupālgarh: Monolithic pillars in the central part of the settlement

"Heretics and Chandalas shall live beyond the burial grounds."⁵

5. The actual word used in the Sanskrit text is *Śmaśāna*.

"There shall be a water well for every ten houses" (Chap. IV).

I have no hesitation in conceding that what the *Arthasāstra* states is by and large 'normative', that is to say it gives the layout of a settlement as it ought to be. At the same time, it would be wrong to assume that most of this is imaginary or without foundation. This view is duly supported by the evidence from Śiśupālgarh itself. Several references from the *Arthasāstra* are duly corroborated by archaeological findings, for example, the presence of a square (*chaturasra*) settlement; fortification walls oriented along the cardinal directions, a moat (*parikhā*) around the fortifications and fed by a perennial stream (*āgantutoya-pūrṇā*); the fortifications comprising a rampart (*vapra*) and overlying brick walls with intermediary earthen fillings (*prākāra*). The *Arthasāstra* describes three royal roads running east-west and three running north-south (*trayāḥ prāchīna rājyārgāstrya udīchīna iti vāstu-vibhāgaḥ*). In the case of Śiśupālgarh, however, there are only two major east-west and two major north-south roads. This may perhaps be due to Śiśupālgarh not being as large a settlement as envisaged in the *Arthasāstra*. As a result, Śiśupālgarh has only eight major gateways, though the *Arthasāstra* speaks of

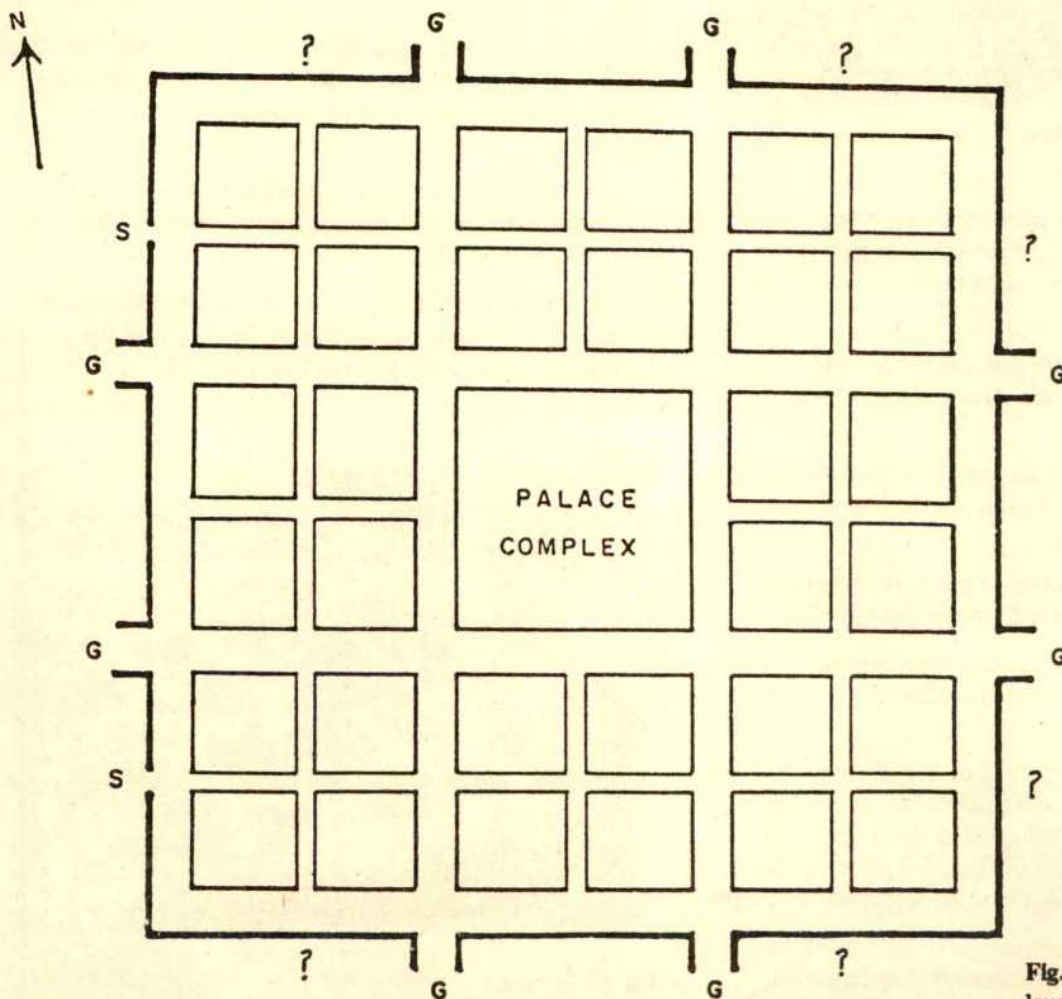


Fig. 21: Śiśupālgarh: Probable layout

twelve (*dvādaśdvāra*). As mentioned earlier, in Śiśupālgarh we have an area, slightly to the north of the centre, where a large number of pillars are still standing. It has been surmised, though not yet established by an excavation, that these might belong to a hall associated with a palace complex. In this context the *Arthasāstra* states: "In the midst of the houses of the people of all four castes and to the north from the centre of the ground inside the fort, the king's palace, facing either the north or the east shall, as described elsewhere (Chap. XX, Book I) be constructed occupying one-ninth of the whole site inside the fort", (*Vāstuhṛdayāduttare navabhāge yathoktavidhānamantahpuram prānmukhamudanmukham vā kārayet*).

What has been exposed through two field seasons excavation at Śiśupālgarh is just a fraction of what really ought to be laid bare. Work is still necessary at least at one more point of the fortification wall to reconfirm its structure in cross section. Likewise, at least one more gateway should be excavated to ascertain whether or not the gates followed the same pattern. The smaller gates which have not been exposed as also the corner towers, regarding the plans of which we are completely in the dark, need equal attention. What is much more important, however, is the exposing of the layout of the township itself. We have so far only an inkling of a stone-paved road which ran east-west, and of the alignment of the two gateways located in the northern parts of the western and eastern sides. Houses flanking this road have also been identified. With this as the starting point, excavations should be continued towards the east, reaching in the first season of the resumed operations at least the spot where the western part of the major north-south roads cross the above mentioned east-west road. Likewise the pillared area should also be accorded high priority to ascertain its real nature and other details. If it indeed turns out to be a palace complex, it would prove crucial to the whole layout.

The *Arthasāstra* gives comprehensive details about the location of the treasury, elephant-stable, store-houses, shrines, etc. all with reference to the palace complex as the nodal point. As may have been noticed, it also says that the Brāhmaṇas, Kshatriyas, Vaiśyas and Śūdras, should reside respectively, in a clock-wise manner, to the north, east, south and west of the palace complex (*Brāhmaṇāscha uttarām diśamadhivaseyuh; Kshatriyāscha pūrvām diśmadhivaseyuh; Vaiśyāscha dakṣiṇām diśamadhivaseyuh; Śūdrāscha paschimām diśamadhivaseyuh*).

It might reasonably be asked, how does one identify the residences of Brāhmaṇas, Kshatriyas, Vaiśyas and Śūdras? While admittedly there is no easy yardstick by which this can be ascertained, at the same time this need not pose an insurmountable problem. Perhaps the houses of the first three *varṇas* would be larger than those of the Śūdras. Perhaps also their actual plans would be somewhat different. Besides, it is likely that in the houses of the Brāhmaṇas *yajñasālās* and *havana kuṇḍas* might be exposed, those of

the Kshatriyas might yield evidence of bows, arrows, swords and shields, those of the Vaiśyas may contain trading equipment and precious goods, while those of the Śūdras may perhaps be devoid of any noteworthy possessions. This is only a tentative supposition.

Actual excavation may or may not prove this to have been the case and other criteria for differentiation might emerge. What I am pleading for is that an attempt ought to be made to ascertain such details in respect of Śiśupālgarh. The site is ideally suited to this kind of work, since there are no later strata superimposed on the Early Historical ones to which the fort belongs. A few years ago I had recommended to the Archaeological Survey of India that it resume excavations at this site and, in fact, I went to the site to point out where exactly the trenches ought to be laid out. A probable layout of the town is given in Fig. 21. Nothing has been done so far, but I am told by the Director General of the Archaeological Survey of India that he hopes to initiate work at Śiśupālgarh in the near future. The literary evidence discussed above may perhaps help us to interpret the data yielded by the excavations.

There are many other problems which it would be desirable to tackle through a close collaboration between archaeologists and scholars of the ancient texts, both Sanskrit and Dravidic. However, here I shall highlight only one. Although discovered nearly seventy years ago, the Indus Civilization still remains an enigma in so far as its ethnic identity is concerned. In the inscriptions on the seals, pottery, metallic objects, etc. some have identified the Sanskrit language, whereas others have said that it is Dravidian. In a number of cases I have demonstrated the in-built faults in the methodologies of the decipherers concerned, but what is surprising is that no noteworthy scholar of Sanskrit or any Dravidian language has come forward with detailed comments on the end-product of these decipherments. Elsewhere I (Lal 1983) have demonstrated that if the values ascribed to the various symbols are accepted, the reading of one of the inscriptions would be nothing but *hahavar* (𑀧𑀸𑀓𑀭𑀺𑀓).

Then there is the problem of equating, 'bit by wit', the material culture obtained from the early Vedic texts on the one hand and remains associated with the Indus Civilization on the other. Some say that the Vedic culture was essentially a rural one, whereas the Indus Civilization was essentially urban. In this context, there is also a debate about the presence of the horse in the Indus Civilization. Sites like Harappa, Mohenjo Daro and Kalibangan, etc. have not yielded the remains of this animal, but some evidence, though meager, is said to be available from Lothal, Surkotda, etc. The seals on which so many other animals are depicted are completely devoid of the horse. Why?

Let us also not completely set aside the possibility that the Indus language may not be either Sanskrit or Dravidian but may have belonged to a group not known to us. Thus, I

am not arguing here in favour of one view or the other. I am only pleading for an in-depth study of literary texts by experts on the one hand and an equally thorough re-examination of the archaeological data on the other.

If through this lecture I am able to inspire even a few archaeologists and a few scholars of ancient texts to embark upon the kind of collaboration suggested herein I will have achieved my objectives. I want Dandekars and Sankalias to come closer to one another for the sake of a common cause — a proper interpretation of the past.

I thank you all for the patient hearing extended to me and the organisers for having given me the opportunity to deliver the first Professor H.D. Sankalia Memorial Lecture.

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Table 1: Measurements of *angulas*, *vitasti*, etc., of some individuals

Sl. No.	Name	Father's Name	Locality	Age (in yrs)	Height (in cm)	4 <i>angulas</i> (in cm)	1 <i>Vitasti</i> (in cm)	1 <i>Hasta</i> (in cm)
1.	Shri Shrinarayan	Shri Tej Mani	Sringaverapura	22	170.5	7.9	22.1	46.8
2.	Shri Nand Lal	Shri Kallu	Ram Chaura	24	164.8	7.8	21.8	47.8
3.	Shri Ram Raj Yadav	Shri Bindeshwari Pd. Yadav	Moharabe	22	164.5	7.2	21.4	46.0
4.	Shri Rama Shankar	Shri Birraha	Shyampur	19	168.5	7.3	22.2	46.0
5.	Shri Lallan Pande	Shri Chhotey Lal Pande	Sringaverapura	26	170.0	7.4	20.5	44.5
6.	Shri Ramji Misra	Shri Ram Achraj Misra	Ram Chaura	28	168.0	7.3	21.0	46.4
7.	Shri Phool Chandra Misra	Shri Ram Kishore Misra	Malian-ka-pura	22	160.0	7.3	21.4	43.8
8.	Shri Ram Singh Yadav	Shri Ram Dass Yadav	Khanjia	22	164.0	6.9	21.6	43.6
9.	Shri Sukh Ram	Shri Ram Charan	Shyampur	25	165.0	7.9	20.0	42.3
10.	Shri Onkar Nath Yadav	Shri Chhote Lal	Guru-ka-pura	27	172.0	7.5	21.0	45.5
11.	Shri Narendra Deo Misra	Shri Mahatam Misra	Bishanpura	24	159.0	6.5	18.0	42.0
12.	Shri Ramesh Chandra Shukla	Shri Deonath Singh	Sambharpur	24	169.0	7.4	24.3	48.2

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Blade and Blade Tool Assemblages of the Upper Palaeolithic and Mesolithic Periods — A Case Study from the Mid-Kasai Valley in the Jhargram Sub-Division of Midnapur District, West Bengal

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Abstract

Blades and blade tools constitute the major elements of the Stone Age industry in West Bengal. But so far no attempt has been made by any scholar to study the evolution or succession of the blade tool industry from the Upper Palaeolithic to the Mesolithic period. This paper aims at solving this issue through a case study in the mid-Kasai valley which shows that the Upper Palaeolithic blade tools gradually evolved into microlithic blade tools of the Mesolithic culture.

Introduction

Prehistoric research in West Bengal began more than a century ago with Valentine Ball's study (1865) of stone implements. However, it was not until the mid-forties of this century that prehistoric studies formed an important aspect of scientific investigations. Systematic and well organised explorations followed by an analysis of the data were undertaken by a number of scholars including Chakladar (1941, 1942, 1952), Sen (1948), Lal (1958), Krishnaswami (IAR 1959-60), Sen *et al.* (1963), Ghosh (1961, 1962, 1966, 1978), Ghosh and Chaudhury (1991), Dasgupta (IAR 1962-63, 1963-64, 1964-65, 1968-69; 1981), Dani (1960), Datta (1982, 1988-89, 1985, 1991a, 1991b), Nag (1987), De (IAR 1982-83, 1983-84), Datta and Roy (1988), Datta *et al.* (1984), Ray and Datta (1977), Ray (1991), etc. The work carried out by these scholars has yielded considerable information relating to the location of Lower, Middle and Upper Palaeolithic as well as Mesolithic and Neolithic sites. Their research has also helped us understand the different constituent elements of the Stone Age industries, namely, technology, stratigraphy and other problems concerning the prehistory of West Bengal. However, there are still many gaps in our knowledge in terms of prehistoric settlement patterns, ecology, the nature of prehistoric economies, diffusion mechanisms, etc. which are very important for our understanding of the dimensions of cultural growth in West Bengal.

Area of Investigation

Palaeolithic sites appear to be concentrated in the southwestern part of West Bengal. This region is considered to be an

extension of the Chotanagpur plateau. The average annual rainfall in this region is 140 cm and is the lowest in the state. This region is divided into two physiographic units, i.e., the old deltaic plains of the west and the present floodplain comprising a wide strip of land. These areas are supposed to have been most favourable for early human settlement in West Bengal (Ghosh 1978). In this region, blade tools constitute one of the basic elements of artefact assemblages, and in terms of percentage they gradually increase from the Upper Palaeolithic onwards. In the absence of stratigraphical sequences, however, the exact chronological position of these artefacts remains uncertain. So far in West Bengal there have not been any serious studies on blade tools. The present paper is aimed at examining the different aspects of blade tool assemblages.

The author has surveyed an area measuring 164 sq km in the mid-Kasai valley, Midnapur District (Fig. 1). In this area, all categories of Stone Age sites have been found including Lower Palaeolithic (Ghosh 1966), Middle Palaeolithic (Ray 1991), Upper Palaeolithic (Datta and Ray 1988), Mesolithic (Datta *et al.* 1984) and Neolithic (Datta 1991) sites. Since this paper is concerned with Upper Palaeolithic and Mesolithic cultures, five representative occurrences have been selected as a case study. Of these sites, two belong to the Upper Palaeolithic and the other three are Mesolithic. The names of the five localities are:

1. Kattara I Upper Palaeolithic
2. Kattara II Upper Palaeolithic
3. Laljal Mesolithic
4. Srinathpur Mesolithic
5. Asri Mesolithic

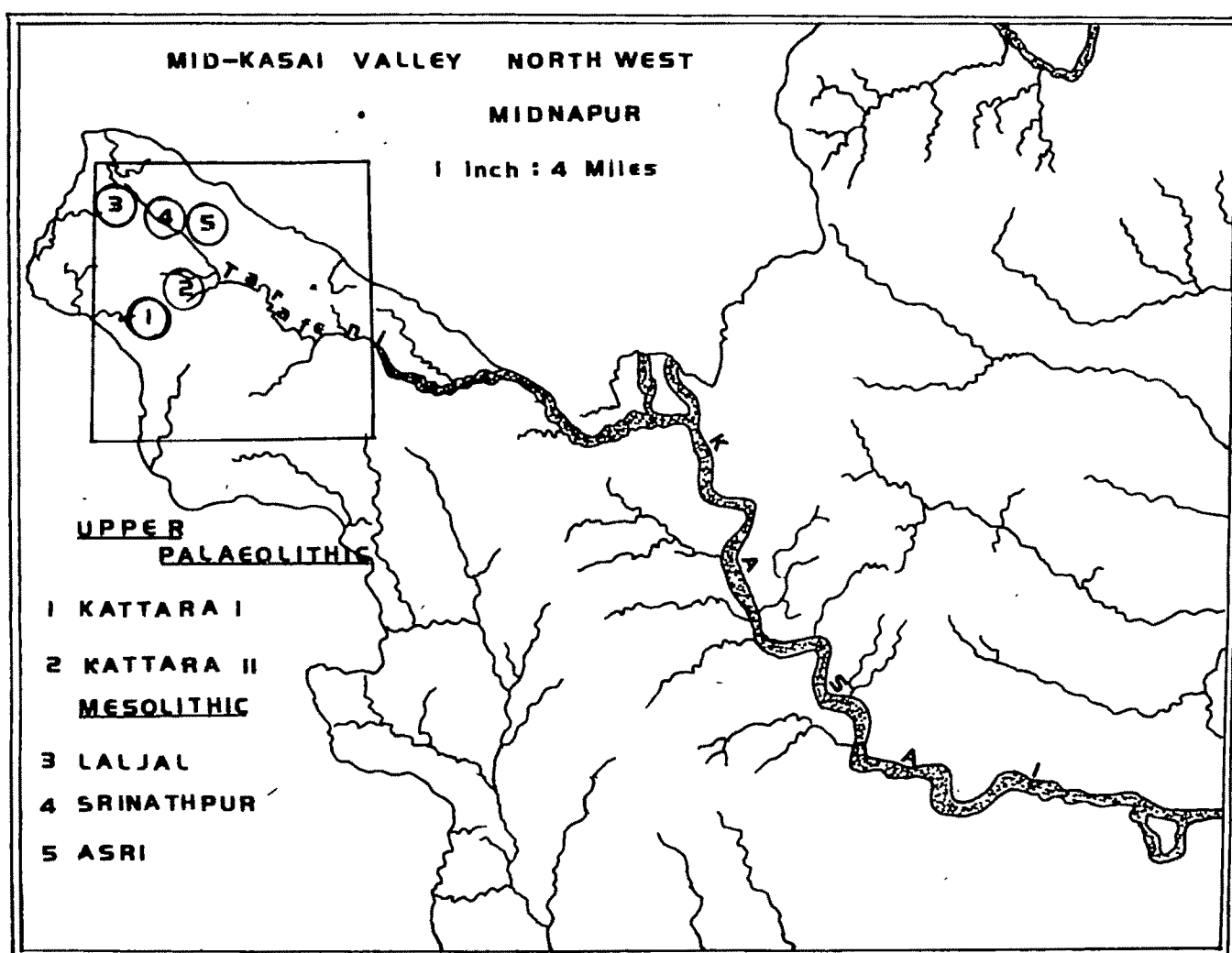


Fig. 1: Distribution of sites

Distribution of Sites

Kattara I: This site ($86^{\circ} 41'E: 22^{\circ} 40'N$) is situated on the left bank of a small nullah flowing in an east-west direction before joining another small stream which finally meets the river Tarafeni, a tributary of the Kasai river. The site is about 12 km northwest of Belpahari Police Station. Since the site is situated on an elevated slope of the nullah, most of its deposits have been washed away by erosional activities exposing the dissected Mio-Pliocene tableland consisting of sandstone and shale. The initial explorations yielded a large number of Upper Palaeolithic tools comprising blades, scrapers, points, borers, lunates, etc. among which, blades and blade tools form the major component.

Kattara II: This site ($86^{\circ} 41'E: 22^{\circ} 40'N$) is in close proximity to Kattara I and is situated on the left bank of the small stream which joins the Tarafeni. The site has yielded Upper Palaeolithic tools comprising blades, points, scrapers, etc.

Laljal: This is a small village ($86^{\circ} 41'E: 22^{\circ} 45'N$) situated on the left bank of the river Tarafeni. It is about 18 km

northwest of Belpahari Police Station. The site yielded a large number of Mesolithic tools both from excavation and from the surface (Datta *et al.* 1984). The tools comprise blades, points, lunates, scrapers, burins, borers, etc.

Srinathpur: This village ($86^{\circ} 43'E: 22^{\circ} 45'N$) is situated on the right bank of the river Tarafeni about 16 km northwest of Belpahari Police Station. Mesolithic tools comprising blades, points, lunates, burins, etc. have been collected from this site.

Asri: The village of Asri ($86^{\circ} 42'E: 22^{\circ} 42'N$) is situated on the right bank of the river Tarafeni, about 15 km north of Belpahari Police Station. Points, lunates, scrapers and burins of the Mesolithic period have been collected from this site.

The Blade Tool Industry

Altogether 1,779 artefacts of different tool types have been collected from the above five sites. Among them blades and blade tools constitute 430 specimens (24.17%). Of the 430 blades and blade tools, 124 belong to the Upper Palaeolithic

Table 1: Comparative analysis of blade tools

Sites	Lunates		Simple blades		Blades with step retouch		Blades with marginal retouch		Backed blades		Serrated blades		Penknife blades		Flake blades		Notched blades		Total	
	Total No.	%	Total No.	%	Total No.	%	Total No.	%	Total No.	%	Total No.	%	Total No.	%	Total No.	%	Total No.	%	Total No.	%
Kattara I	1	1.26	27	34.17	5	6.32	8	10.12	17	21.51	4	5.06	-	-	12	15.18	5	6.32	79	99.94
Kattara II	-	-	16	35.55	1	2.22	3	6.66	8	17.77	4	8.88	1	2.22	5	11.11	7	15.55	45	99.96
Grand Total	1	0.8	43	34.6	6	4.83	11	8.87	25	20.16	8	6.45	1	0.80	17	13.7	9	9.67	124	99.95

Table 2: Length, breadth and thickness of blades and blade tools of the Upper Palaeolithic

Length	Number of Specimens	Breadth	Number of Specimens	Thickness	Number of Specimens
2.10	1	0.70	1	0.20	1
2.20	1	1.10	2	0.30	1
2.50	1	1.20	1	0.40	3
2.60	8	1.30	10	0.50	7
2.70	6	1.40	6	0.60	25
2.80	3	1.50	7	0.70	18
2.90	10	1.60	6	0.80	20
3.00	4	1.70	4	0.90	37
3.10	3	1.80	14	1.00	7
3.20	12	1.90	34	1.10	5
3.30	7	2.00	10		
3.40	3	2.10	8		
3.50	5	2.20	4		
3.60	11	2.30	6		
3.70	6	2.40	2		
3.80	17	2.50	2		
3.90	2	2.60	2		
4.00	2	2.70	2		
4.20	2	2.80	2		
4.80	15	3.20	1		
5.10	1				
5.20	1				
6.20	1				
	124		124		124

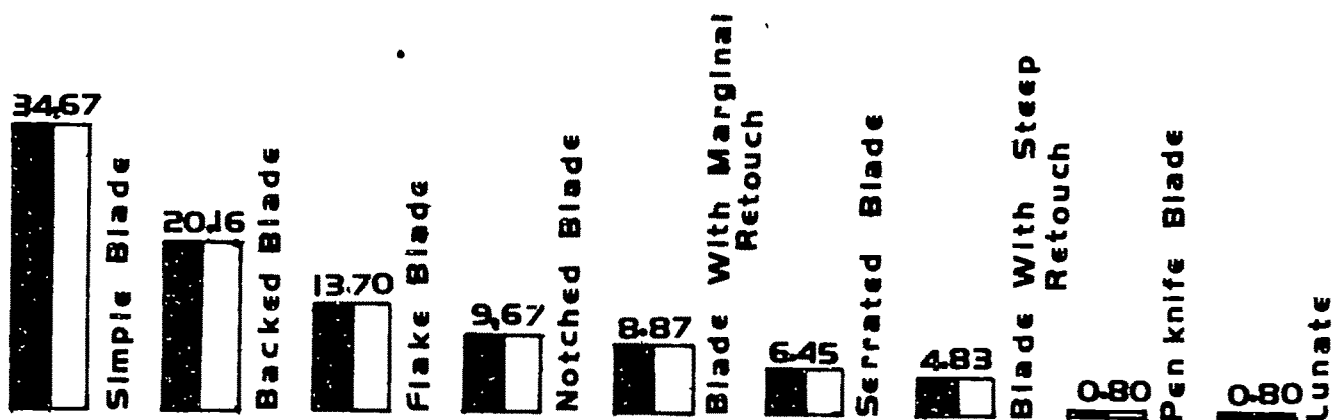


Fig. 2: Distribution of blades and blade tools (Upper Palaeolithic)

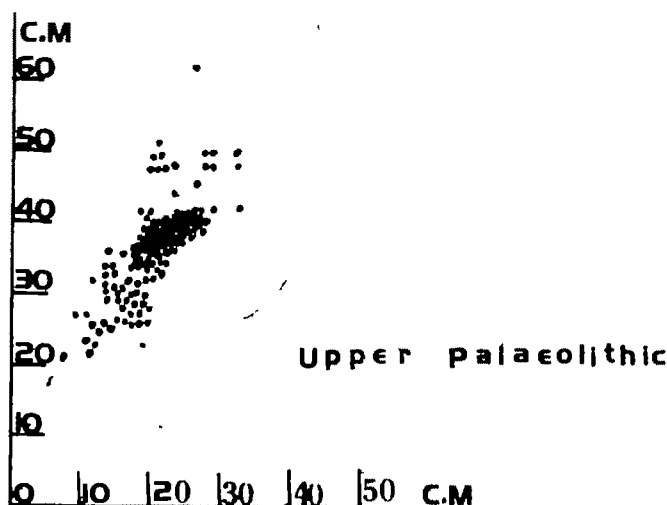


Fig. 3: Scatter diagram of length and breadth frequencies

culture while the remaining 306 belong to the Mesolithic culture.

Upper Palaeolithic

Upper Palaeolithic tools have been collected from Kattara I and II. A comparative study of the different sub-types of blades is given in Table 1.

It appears from Table 1 that the blades and blade tools of the Upper Palaeolithic period are uniformly distributed at both the sites. The blade tool assemblages from these two important sites are dominated by simple blades, backed blades and flakes which together constitute 68.53% of the assemblage. However, in terms of percentage, the simple blades and backed blades form the highest number. At Kattara I, they comprise 55.68% while at Kattara II the percentage is 53.32. At Kattara I, the other major types are flake blades and

blades with marginal retouch which together represent 23.3% of the collection. In the case of Kattara II, however, the other major types are notched blades and flake blades constituting 26.66% of the total assemblage. We can conclude that the Kattara I Upper Palaeolithic assemblage is dominated by simple blades, backed blades, blades with marginal retouch and flake blades, and that these types constitute 80.98% of the total. Similarly at Kattara II the major types are simple blades, backed blades, notched blades and flake blades comprising 79.98% of the total (Fig. 2). It appears from this limited data that the nature and character of the assemblages of the Upper Palaeolithic sites in this region are similar.

✓ The length, breadth and thickness of these blades have been tabulated in Table 2. This indicates that the maximum and minimum dimensions of length, breadth and thickness are 6.20 cm and 2.10 cm; 3.20 cm and 0.70 cm and 1.10 cm and 0.20 cm respectively.

✓ The scatter diagram (Fig. 3) of length and breadth frequencies shows less uniformity in the manufacture of blade tools during the Upper Palaeolithic period as compared to the Mesolithic. The maximum, minimum and mean values of blade tools have been given in Table 3.

Table 3: Maximum, minimum and mean values of the Upper Palaeolithic blade tools

	Length (cm)	Breadth (cm)	Thickness (cm)
Maximum	6.20	3.20	1.10
Minimum	2.10	0.70	0.20
Mean	3.61	1.95	0.65

The mean values of length, breadth and thickness are 3.61, 1.95 and 0.65 cm respectively.

Table 4: Different sub-types and their respective percentages from Mesolithic sites

Sites	Lunates		Simple blades		Blades with step retouch		Blades with marginal retouch		Backed blades		Serrated blades		Penknife blades		Flake blades		Notched blades		Total	
	Total No.	%	Total No.	%	Total No.	%	Total No.	%	Total No.	%	Total No.	%	Total No.	%	Total No.	%	Total No.	%	Total No.	%
Laljal	10	20.83	23	47.91	-	-	3	6.25	1	2.08	2	4.16	4	8.33	3	6.25	2	4.16	48	99.97
Srinathpur	19	13.01	41	28.08	10	6.84	26	17.80	13	8.90	5	3.42	2	1.36	17	11.64	13	8.90	146	99.95
Asri	13	11.60	24	21.42	3	2.67	51	45.53	10	8.92	3	2.67	1	0.89	2	1.78	5	4.46	112	99.94
Total	42	13.72	88	28.75	13	4.27	80	26.14	24	7.84	10	3.26	7	2.28	22	7.18	20	6.53	303	99.94

Table 5: Length, breadth and thickness of blades and blade tools of the Mesolithic period

Length	Number of Specimens	Breadth	Number of Specimens	Thickness	Number of Specimens
1.50	11	0.40	3	0.10	10
1.60	9	0.50	5	0.20	42
1.70	10	0.60	27	0.30	84
1.80	7	0.70	37	0.40	46
1.90	37	0.80	16	0.50	18
2.00	17	0.90	56	0.60	37
2.10	35	1.00	10	0.70	23
2.20	30	1.10	21	0.80	29
2.30	13	1.20	7	0.90	10
2.40	9	1.30	30	1.00	7
2.50	4	1.40	24		
2.60	31	1.50	27		
2.70	20	1.60	10		
2.80	19	1.70	6		
2.90	21	1.80	8		
3.00	9	1.90	16		
3.10	16	2.20	3		
3.20	8				
306			306		306

Mesolithic

Mesolithic tools have been collected from Laljal, Srinathpur and Asri. A comparative study showing the different sub-types along with their respective percentages is given in Table 4. This shows that the bulk of the assemblage is

represented by simple blades with marginal retouch and lunates which together constitute 68.51% of the blade tool assemblage. It also appears from this Table that simple blades constitute the highest number at Laljal and Srinathpur where they are represented by 47.91% and 28.08% respectively. In the case of Asri, however, it is the blades with

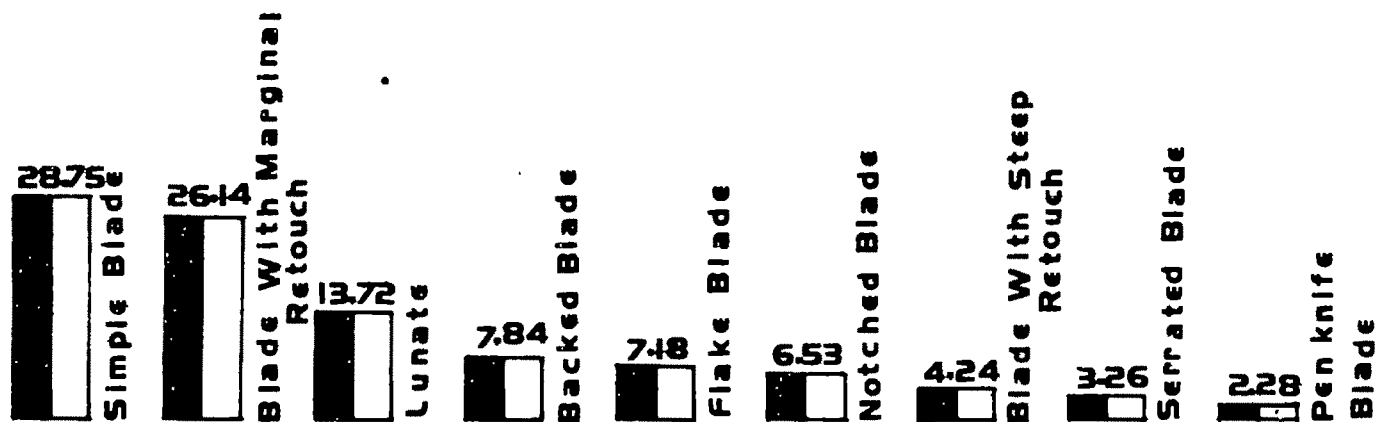


Fig. 4: Distribution of blades and blade tools (Mesolithic)

marginal retouch which form the major component with 45.53%. At Laljal, the major tool types are simple blades, lunates and penknife blades and together they represent 77.07% of the collection. At Srinathpur and Asri, the dominant artefacts are simple blades, lunates and blades with marginal retouch and are represented by 58.89% and 78.55% respectively (Fig. 4). It can further be seen that the three major sub-types constitute almost equal percentages at Laljal and Asri while the other types are negligible, but there is little variation in the distribution of sub-types at Srinathpur.

The length, breadth and thickness of Mesolithic blades and blade tools have been tabulated in Table 5 which shows that the maximum and minimum length, breadth and thickness are 3.20 and 1.50, 2.20 and 0.40 and 1.0 and 0.10 cm respectively.

A scatter diagram (Fig. 5) of the length and breadth frequencies shows a uniform concentration of length and breadth frequencies. The maximum, minimum and mean values of blade tools have been given in Table 6.

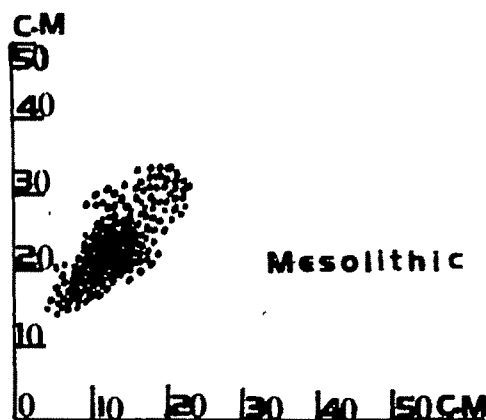


Fig. 5: Scatter diagram of length and breadth frequencies

Table 6: Maximum, minimum and mean values of the Mesolithic blade tools

	Length (cm)	Breadth (cm)	Thickness (cm)
Maximum	3.20	2.20	1.10
Minimum	1.50	0.40	0.10
Mean	2.35	1.21	0.55

Raw Materials

There is always a close relationship between the raw material and the type of tool produced. The hardness, physical and chemical properties of the rocks, and the accessibility of raw material are most important since they have a direct bearing on the artefacts.

Upper Palaeolithic

The distribution of the types of raw material along with their respective percentages given in Table 7 shows that during the Upper Palaeolithic period four main rock types were exploited for the manufacture of blades and blade tools. They were green quartzite, cherty quartz, quartz and chert (Fig. 6). Green quartzite has the highest percentage since this specific rock type is represented by 33.87% followed by quartz with 28.22%. In the case of cherty quartz and chert, the respective percentages are 21.77% and 16.12%. The Table further shows that simple blades, backed blades and flake blades have the highest percentages of tools made on green quartzite and together constitute 73.70%. In the case of quartz which forms the second most common material, 71.41% of this rock type was used for the manufacture of simple blades, blades with marginal retouch and backed blades. While in the case of chert, the Table shows that it is almost equally distributed among the different categories of sub-types instead of being used only for specific types.



Fig. 6: Distribution of rock types

Mesolithic

The distribution of raw materials along with their respective percentages have been shown in Table 8. It shows that unlike green quartzite in the Upper Palaeolithic period, here cherty quartz is the dominant rock type (48.03%). The Table further shows that in addition to the rock types earlier used for the manufacture of tools other rocks like flint, agate, milky quartz, rock crystal, etc. were also used (Fig. 7). However, the earlier four rock types used in the Upper Palaeolithic continued to form the bulk of the raw material used during the Mesolithic period. They constitute about 92.22% but a change in the frequency of each of these materials is noticeable. For example, green quartzite which forms 33.87% during the Upper Palaeolithic period has been reduced to a mere 5.22% during the Mesolithic period. Further analysis shows that cherty quartz with 23.52% forms the secondmost popular rock type, and 75.93% of this was used for the manufacture of lunates, simple blades and blades with marginal retouch. In the case of chert which constitutes only 15.68% of the total collection, 76.63% of this rock type was used to manufacture lunates, simple blades and blades with marginal retouch.

Conclusion

It appears from the above analysis that blades and various forms of blade tools constitute the basic elements of both the Upper Palaeolithic and Mesolithic cultures. The analysis shows that simple blades and backed blades are the two most important tool types together constituting 54.83% while the other types occur with variable frequencies during the Upper

Palaeolithic. However, during the subsequent Mesolithic period, lunates, simple blades and blades with marginal retouch seem to have been the dominant tool types totaling 68.58%. The length and breadth frequencies as shown in the scatter diagrams reveal that there is a close relationship between the two sets of assemblages. This is further supported by the evidence of the maximum, minimum and mean values of length, breadth and thickness of both the assemblages. However, in the case of raw materials, changes are evident, the most noticeable being that instead of the green quartzite of the Upper Palaeolithic period, cherty quartz becomes the dominant raw material of the Mesolithic people in the area of our study.

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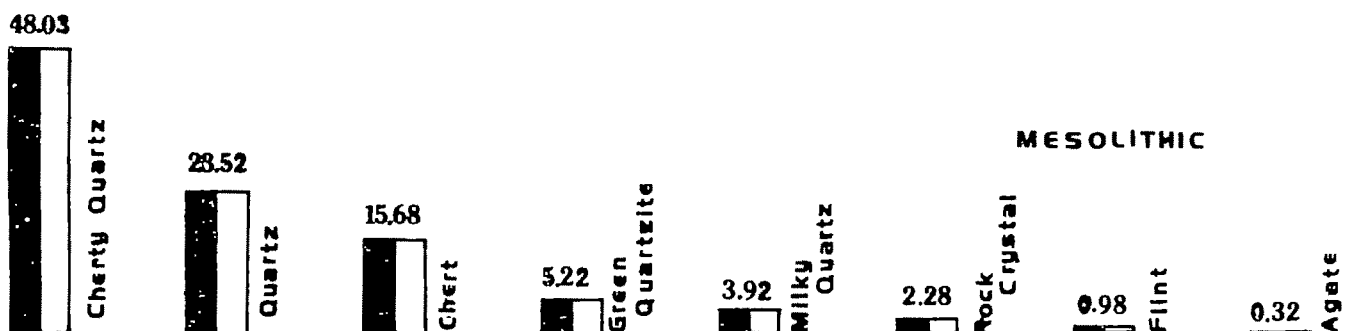


Fig. 7: Distribution of rock types

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Table 7: Distribution of rock types and their respective percentages during the Upper Palaeolithic period

Tools	Green quartzite		Cherty quartz		Quartz		Chert		Total
	n	%	n	%	n	%	n	%	
Notched blade	3	7.14	2	7.40	5	14.20	2	10.00	12
Flake blade	7	16.66	1	3.70	3	8.57	6	30.00	17
Penknife blade	-	-	1	3.70	-	-	-	-	1
Serrated blade	2	4.76	1	3.70	3	8.57	2	10.00	8
Backed blade	8	19.04	7	25.92	5	14.28	5	25.00	25
Blade with marginal retouch	5	11.90	4	14.81	2	5.71	-	-	11
Blade with steep retouch	1	2.38	1	3.70	2	5.71	2	10.00	6
Simple blade	16	38.09	10	37.03	15	42.85	2	10.00	43
Lunate	-	-	-	-	-	-	1	5.00	1
Total	42	33.87	27	21.77	35	28.22	20	16.12	124 99.98

Table 8: Distribution of rock types and their respective percentages during the Mesolithic period

	Quartz		Cherty quartz		Green quartzite		Chert		Flint		Agate		Rock crystal		Milky quartz		Total
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	
Notched blade	5	6.94	11	7.48	3	18.75	1	2.08	-	-	-	-	-	-	-	-	20
Flake blade	7	9.72	13	8.84	1	6.25	1	2.08	-	-	-	-	-	-	-	-	22
Penknife blade	-	-	5	3.40	-	-	-	-	2	66.66	-	-	-	-	-	-	7
Serrated blade	1	1.38	5	3.40	-	-	2	4.16	-	-	-	-	-	-	2	16.66	10
Backed blade	2	2.77	17	11.56	-	-	5	10.41	-	-	-	-	-	-	-	-	24
Blade with marginal retouch	17	23.61	41	27.89	5	31.25	12	25.00	-	-	-	-	2	28.57	3	25.00	80
Blade with steep retouch	2	2.77	9	6.12	-	-	2	4.16	-	-	-	-	-	-	-	-	13
Simple blade	27	37.50	23	15.64	7	43.75	19	39.58	1	33.33	1	100.00	5	71.42	5	41.66	88
Lunate	11	15.27	23	15.64	-	-	6	12.50	-	-	-	-	-	-	2	16.66	42
Total	72	23.52	147	48.03	16	5.22	48	15.68	3	0.98	1	0.32	7	2.28	12	3.92	306

Some Basic Issues Related to the Metrical Analysis of Stone Tools

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Abstract

It is seriously felt that the statistical techniques employed in the study of stone artefacts from prehistoric sites in India, lack necessary methodological care. To overcome this serious lapse on the part of archaeologists, the standard protocol for data analysis is described in this paper, and involves the checking of assumptions, and choosing the variables and appropriate test procedures. Such standard protocol, if adhered to, would lead to a more meaningful interpretation of the raw data.

Introduction

After initial attempts by Roe (1964), it has become a common feature of site reports and doctoral dissertations to present the results of statistical analysis of stone tools. However, in many cases statistical tests are either applied without taking care to choose a method with appropriate parameters (Kumar 1989) or the tests are of limited use in the study concerned (Lele and Koti 1970). Further many such studies carry a lot of redundant information and/or the calculated indices are irrelevant to the research goals. This paper is an attempt to review basic methodological issues and to provide a systematic protocol of statistical analysis.

Material and Methods

Basic metrical analytical techniques relating to stone tools have now been standardized (Joshi and Marathe 1975-76) following the pioneering work of Roe (1964). The scope of this paper is limited to the data on handaxes published by Joshi and Marathe (1975-76), Kumar (1989) and Alam (1990).

It must be explicitly stated that the data used here have not been checked for measurement errors, since the studies concerned do not mention the nature and magnitude of potential methodological errors. In addition, these case studies have been examined from the point of view of the methodological problems involved in statistical analysis, with no intention of criticizing individual research scholars.

The Variables

According to Roe (1964), it is possible to measure eight variables on handaxes, viz. Length (L), Breadth (B), Thickness (T), L1, L2, T1, B1 and B2. Essentially these are linear measurements taken at various points on a handaxe and can be classified as '*primary variables*'. Roe (1964) has suggested that certain indices which belong to the category of '*Secondary variables*' can be calculated from the basic linear measurements. The following indices are commonly reported in the literature:

1. Refinement Index : T divided by B
2. Refinement Index : T1 divided by L
3. Shape Index : B divided by L
4. Shape Index : B1 divided by B2

These indices may be classified as '*derived variables*'. A critical question involved in the analysis of linear measurements in archaeological studies is: Why and how should one choose derived variables for performing analysis of the primary data? This question is yet to be satisfactorily answered (Whallon 1982). It has been noticed that a set of variables without significant association among them is often used and often the analysis of the derived variables (e.g. indices) turns out to be a meaningless exercise (Christensen and Reed 1977).

Results and Discussion

Before undertaking multivariate analysis or multiple regression analysis, certain fundamental steps in data management

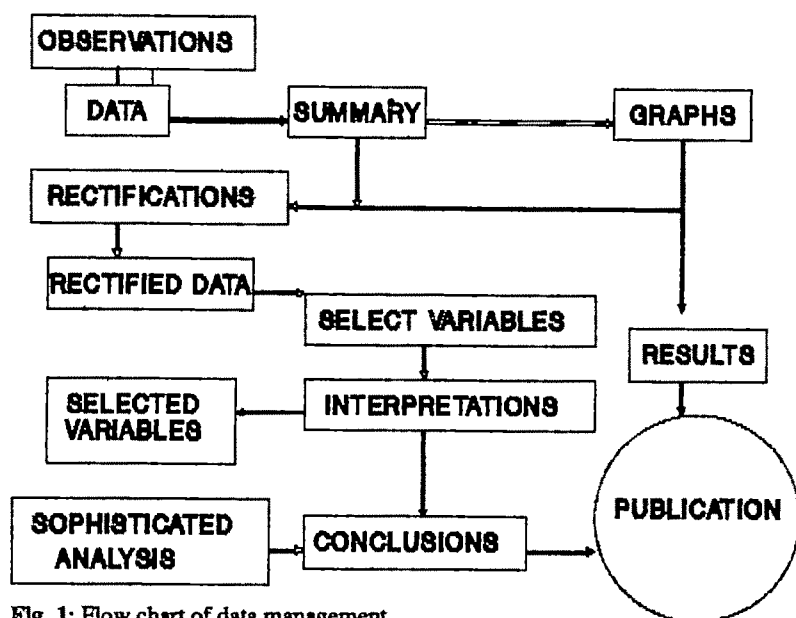


Fig. 1: Flow chart of data management

must be followed. A systematic method of data management is described in the flow diagram (Fig. 1).

Simple descriptive statistics of original variables are sufficient to indicate the nature of primary variables and their reliability for further analysis. Coefficients of variation (CV%) of handaxes studied at various sites are summarized in Table 1.

It is clear from the Table 1 that primary variables vary between 14 to 32 % except for the Chirki handaxes. In general the indices show more variability. For instance, the CV% ranges from 12 to 74 with the exception of B/T

calculated for the Chirki handaxes. Why do secondary variables show more variability than primary variables?

If one operates with two variables, say x and y in statistical language, it is important to consider the nature of their relationship as shown in the following equation.

Variance of y = variance of y due to x + variance of y not due to x

$$S_y^2 = S_{y,x}^2 + S_o^2$$

The ratio S_o^2/S_y^2 or percent variance unexplained due to the relationship between x and y is an important quantity

Table 1: CV% calculated on handaxes at various sites

	Sites				
	Wagan	Chirki	Gambhiri	Gangapur	Bhimbetka
Source	Misra (1967)	Joshi & Marathe (1975-76)	Misra (1967)	Kumar (1989)	Alam (1990)
Variable					
L	18.39	27.00	21.74	14.05	21.70
B	24.67	3.97	21.61	15.07	32.21
T	24.67	25.13	28.50	21.20	24.98
B/L	17.90	-	11.76	17.18	22.77
B/T	22.22	2.41	18.36	73.80*	23.19*
T/L	16.61	-	21.05	18.51	-
n	35	88	25	17	16

(* T/B used here is the inverse of B/T)

that needs further investigation. The ratio S^2_x/S^2_y is inversely proportional to the degree of association between x and y . If x and y are strongly correlated, most of the variance is expected to be explained by $S^2_{y,x}$. It is possible to examine the nature of relationships between L , B and T with the help of the results given by Kumar (1989) on Gangapur handaxes (Table 2).

Table 2: Correlations among different variables

Variables	r	$(1-R^2)$
Length and Breadth	-0.45	0.7975
Breadth and Thickness	+0.03	0.9999
Length and Thickness	+0.62	0.6156

The quantity $(1-R^2)$ is the estimator of $S^2_{y,x}$.

From the above Table it is clear that none of the relationships are strong enough, because 62 to 99% of the variation in one variable remains to be explained by the association. In other words the primary variables in these cases are not associated with each other. The calculation of an index by dividing one variable with another carries an implicit assumption that the two variables must be strongly correlated. If the reverse is true, then the series of new numbers in the form of indices has no validity.

The nature of the relationship among variables in the absence of the correlation coefficients can also be examined as follows. If $S^2_{y,x}$ is large enough, then the CV% of the index should be less than the CV% of the original 'y' variable. Such a reduction has been noticed in the case of the Chirki handaxes, where CV% of the index B/T is 2.4 and that of thickness is 25%. In other cases, the reduction of variance is not substantial. For instance, about 18.4% of variation in length has been reduced to only 17.9% as in the case of the B/L index for Wagan handaxes. The exact opposite has been noticed for the Bhimbetka and Gangapur handaxes. Here the variation in the index is more than the variation of the primary variables. For example B and T in the case of the Gangapur handaxes vary by 15.0 and 21% respectively, while their index T/B varies by 74%. This indicates that the association between the primary variables is weak and consequently the calculation of the index is not justifiable.

Conclusions

The refinement and shape indices are often misinterpreted because workers do *not* follow standard statistical protocols. A standard protocol starts with the checking of assumptions, both implicit and explicit. A thorough look at the primary data is a *must* before statistical techniques are applied. If such a procedure is not followed, one may continue to report information that is redundant and often collected by invalid procedures as shown by Christensen and Reed (1977) and Whallon (1982).

If optimisation is an aim of research methodology, it can best be achieved by handling primary data on the basis of a more mathematical and logical approach. A basic understanding of the currently employed statistical techniques, their meaning and limitations is necessary for the improvement of research methodology and for gaining meaningful interpretations.

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Archaeology of Dharmapuri District, Tamil Nadu

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Abstract

Archaeological sites in Dharmapuri District, Tamil Nadu range in age from the Early Palaeolithic to the Megalithic. Recent explorations have brought to light a Lower Palaeolithic site, 42 Neolithic sites and about 170 Megalithic ones. Trial excavations have yielded data on settlement patterns and burial practices during the Megalithic period. In addition the rock paintings which occur in the vicinity of Megalithic burials and on the orthostats of dolmens have also been described.

Introduction

Recent explorations carried out in the Dharmapuri district of Tamil Nadu (12° 10' to 12° 55'N and 77° 28' to 78° 44'E) have yielded rich evidence of pre- and proto-historic cultures (Fig.1). The study area is spread over about 9600 sq km and comprises the present talukas of Krishnagiri, Hosur, Denkanikkottai, Pennagaram, Palacode, Dharmapuri, Harur and Uttangarai. One Palaeolithic site, five Neolithic sites, about 170 Megalithic sites (Table 1) and about ten sites with rock paintings have been located. In addition about 125 herostones from the Early Medieval period were also discovered in this area.

Table 1: Distribution pattern of the Megaliths in Dharmapuri District

Sr. No.	Taluka	No. of cairn circle sites	No. of dolmen sites	Total no. of sites
1.	Dharmapuri	20	—	20
2.	Harur	23	—	23
3.	Uttangarai	4	—	4
4.	Palacode	6	—	6
5.	Pennagaram	17	—	17
6.	Denkanikottai	33	1 ?	34
7.	Hosur	16	4	20
8.	Krishnagiri	33	13	40
Grand total		152	18	170

The Palaeolithic Culture

In 1887, Robert Bruce Foote collected palaeoliths from Barugur in Dharmapuri District (Foote 1916). Later B. Narasimhaiah (1980) located a stone artefact assemblage near Kappalavadi which he assigned to the pre-Neolithic phase. In the present survey yet another site was noticed at Varatanapalli in Krishnagiri taluka. It lies 11 km away from Krishnagiri on the Krishnagiri-Kuppam road. Handaxes, cleavers, scrapers, ovates, etc., were collected from the slope of a hillock called Erakeddu about 5 km east of Varatanapalli village (Figs. 2 and 3).

The Neolithic Culture

Narasimhaiah located five Neolithic habitation sites: Gollapalli and Togarapalli in Krishnagiri taluka and Pannimaduvu, Dailmalai and Mullikadu in Harur taluka, as well as factory sites at Kappalavadi and Barugur. The Neolithic tools mostly made of dolerite with a few exceptions like hornblende gneiss, granite and syenite were found at Mullikadu (22 axes), Dailmalai (11) and Togarapalli (9). Based on the occurrence of microliths along with Neolithic artefacts, he has divided the Neolithic into five phases and dated them as follows (Narasimhaiah 1980):

1. Pre-Neolithic stone industry — 3500 B.C. ?
2. Pre-pottery Neolithic culture — 3000-2800 B.C.
3. Neolithic culture, phase I — 2800-2200 B.C.
phase II — 2200-1800 B.C.
phase III — 1800-500 B.C.

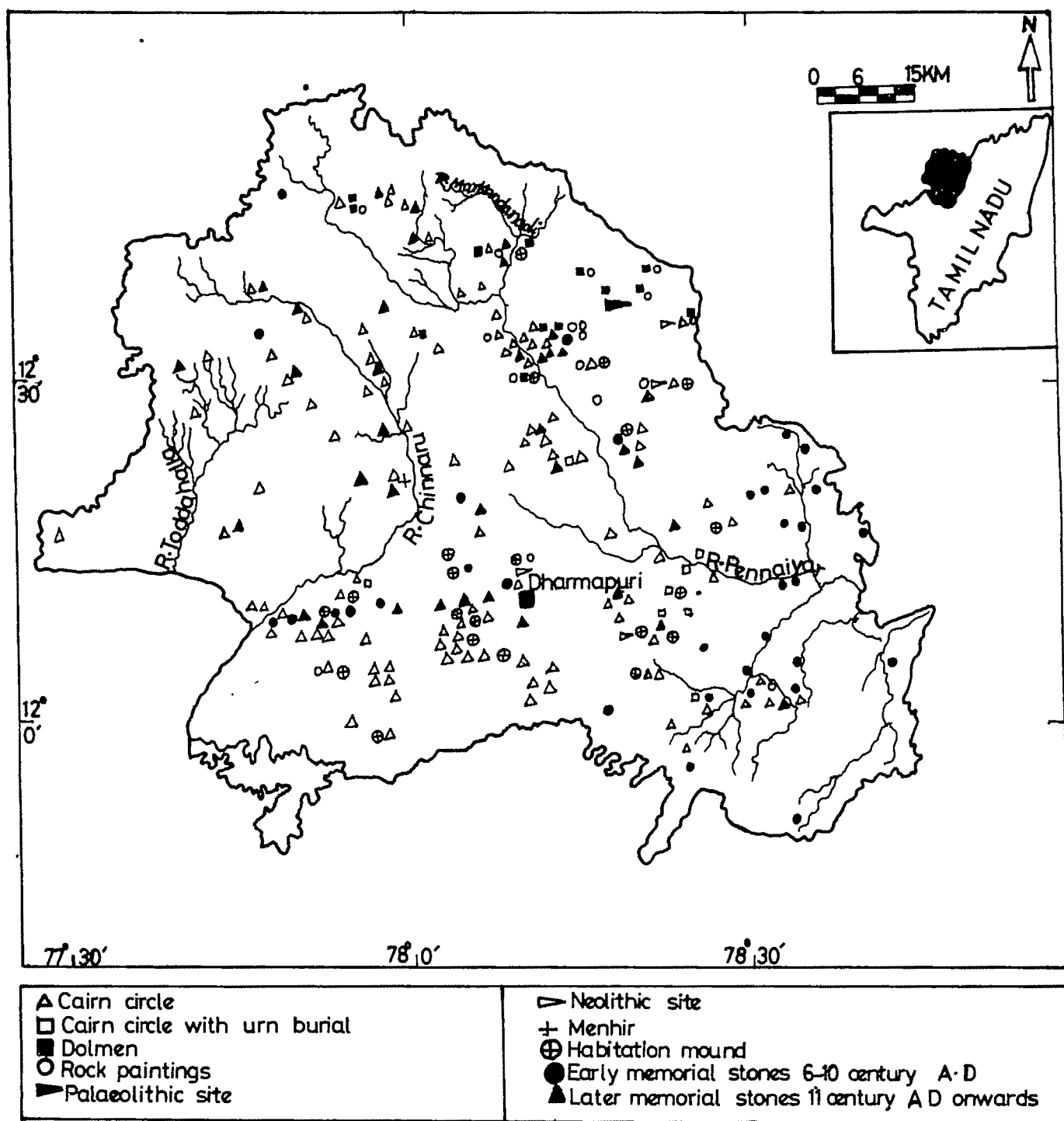


Fig. 1: Archaeological sites in Dharmapuri District

The occurrence of large quantities of polished stone axes and microliths in the same stratigraphic position as the sites situated in the plains and the absence of ceramics from the hill top sites, led him to believe that there could be a pre-pottery Neolithic phase. These three Neolithic phases were established after trial digs at Dailmalai, Togarapalli and

Mullikadu. According to him, Red Ware was dominant in the first phase of the Neolithic culture at Dailmalai, and in the second phase at Togarapalli along with a few Gray Ware pieces and stone blades. The third phase, represented at Mullikadu, consisted of Gray Ware and stone blades in large quantities. It is further said that the third phase noticed at

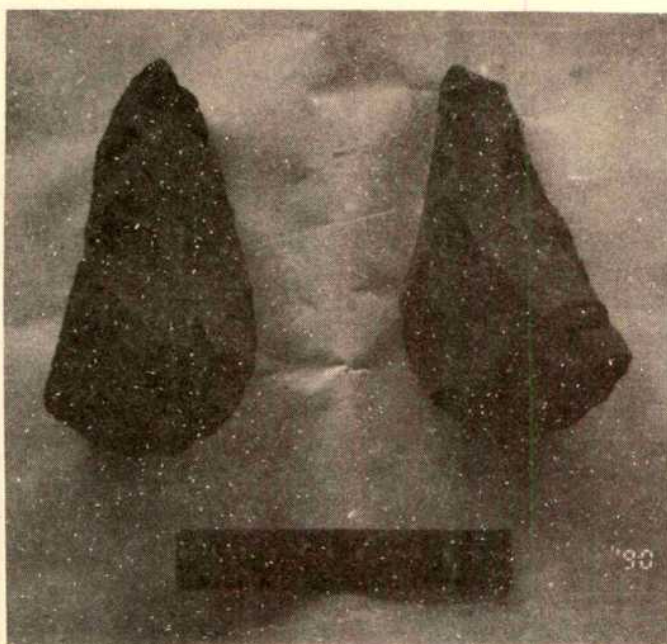


Fig. 2: Varatanapalli: Handaxes

Mullikadu is contemporary with the Neolithic phase of Paiyampalli which is dated to 1800 B.C. Based on this Narasimhaiah (1980) pushed back the dates of the second and first phases to 2200 B.C. and 2800 B.C. respectively.

The present survey has also brought to light evidence for the Neolithic at sites like Modur, Vedarhattakkal and Kolahattur in association with Black and Red ware. These sites failed to yield any stone blades as discovered by Narasimhaiah in his third Neolithic phase. The surface collection suggested that it may represent a transitional phase between the Neolithic and Megalithic. However, this can only be a tentative suggestion pending systematic excavation of these sites.

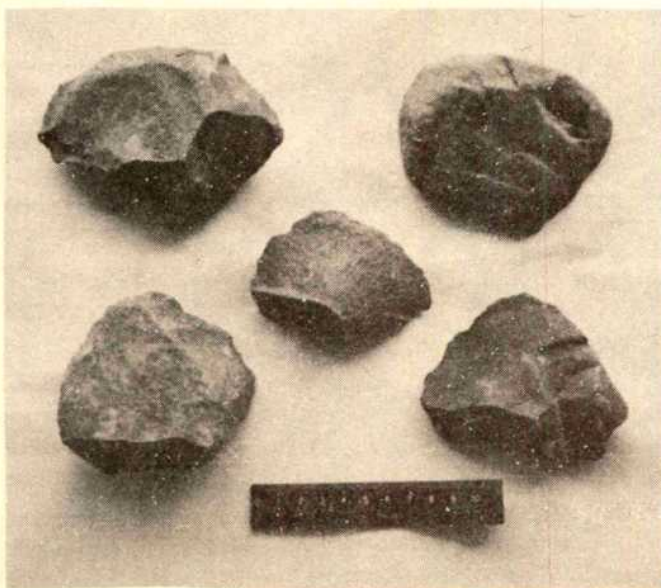


Fig. 3: Varatanapalli: Scrapers

The Megalithic Culture

Since the first discovery made in Dharmapuri District by Phillip Maurice (1873) about 170 burial sites, both cairn circles and dolmens, have been brought to light so far, of which about 150 sites were discovered during the author's explorations (Table 2). They are evenly distributed in the eight talukas of this District (Table 1).

Spatial Distribution Pattern of Megaliths

Unlike other parts of Tamil Nadu the present area of study has yielded evidence for three different Megalithic types such as cairns, dolmens and sarcophagi in the three geographical zones under study (Fig. 4). The cairn circle was probably the product of influences from the region along the Kaveri river, for example the Mandya District of Karnataka. The dolmen was probably influenced by movements through the Kuppam and other passes of the Kolar district of Karnataka and the Chittoor district of Andhra Pradesh. The sarcophagus, on the other hand, was probably the result of influences from North and South Arcot Districts, mainly along the river Pennaiyar (formerly Ponnaiyar).

The concentration of cairn circles with portholed cists were observed in the Balaghat region comprising the talukas of Hosur, Denkanikottai and Krishnagiri. This area being an extension of the Mysore tableland it is quite natural that there should have been an inflow of cultural traits. The distribution of cairn circles with cist burials was concentrated north of Melagiri and Rayakottai as well as west of Ankusagiri. Burial sites are located in river valleys like the Sanatkumaranadi (Chinnaru), Kaveri and Pennaiyar and in the basins of Natarapalayam, Anchetti and Urigam.

The second zone east of Ankusagiri and the Markandandadi river and north of Kaveripattinam and Mattur facing the Kuppam and Tiruppattur passes has a greater concentration of dolmens. This is the area just above the plains and almost covers the entire Krishnagiri taluka. A few cairn circles were also observed in this region but were confined mostly to the southern part.

The third zone comprising Palacode, Pennagaram, Dharmapuri and Harur yielded cairn circles with urn burials. However, the urn burials are more numerous in the eastern part (i.e. in Harur taluka) and decrease towards the west. Cairn circles with portholed cists occur in considerable numbers in Pennagaram and Palacode talukas. Towards the east the number of portholed cist burials decrease and cairn circles containing urns increase.

A study of the major burial types and their sub-types as well as information regarding their location with respect to geography is necessary to understand the Megalithic culture in its correct perspective. Furthermore knowledge of the various types of megaliths and their architectural features will also help us to discover the nature of interaction with neighbouring regions.

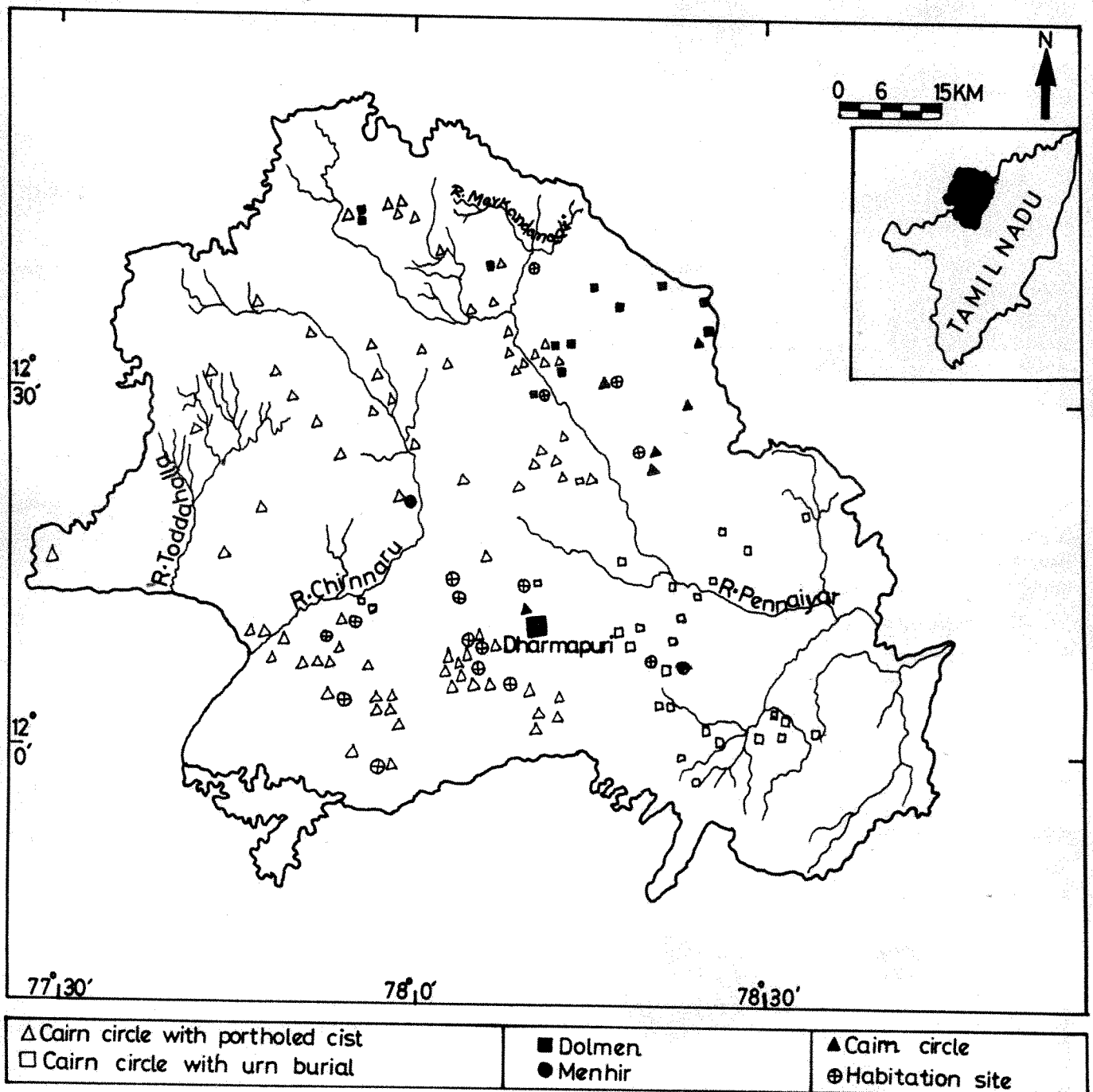


Fig. 4: Distribution of Megaliths in three different geographical zones

Location of the Megaliths

The accessibility of raw material played a major role in the selection of burial sites. Usually in this region, the cairn circles are found on the slopes of hills and hillocks overlooking rivers. Cairn circles with portholed cists are found in

areas that are presently densely forested and cairn circles with urn burials are found around hillocks. The dolmens are located on the tops of high, rocky ground or hills overlooking a tank or in the vicinity of perennial ponds. An elevated area was always selected and the undulating landscape of the region was eminently suitable for this purpose.

Raw Material

The present location of the graves clearly demonstrates that raw materials such as granite boulders and slabs were available within a distance of one or two kilometres. Boulders were used for the circles and slabs for the orthostats and for the cists and the outer circles. The cists were made of rough slabs as well as dressed slabs and capstones were generally not dressed. The majority of dolmens and the associated circle of slabs were constructed only of dressed stones.

Distribution Pattern

Observations made at selected sites comprising more than 200 burials of different types yielded certain clues as to their distribution pattern within a burial complex. When a site had more than one type of burial, each type occupied a distinctly separate portion within the complex (e.g. Mungilpudur, Pachchihanapalli).

It appears that the initial activity of the Megalithic people was restricted to the elevated parts of the landscape or to the vicinity of the foothills. The average distance between two burials varies from two to five metres. An interesting observation made at Mallachandiram was that there are small dolmens at regular intervals around comparatively bigger dolmens encircled by stone slabs.

The cairn circles containing cists stand about 1 m above the ground level (Fig. 5), whereas the cairn circles containing urn burials were raised 30-50 cm above the ground level. The pattern of distribution that seemed to emerge from this survey was that in each locality within a 5 km radius there are clusters of burials connected with each other.

Types of Burials

The burials of this area can be broadly divided into two groups namely cairn circles and dolmens. With only a few



Fig. 5: Cairn circle enclosing a cist burial

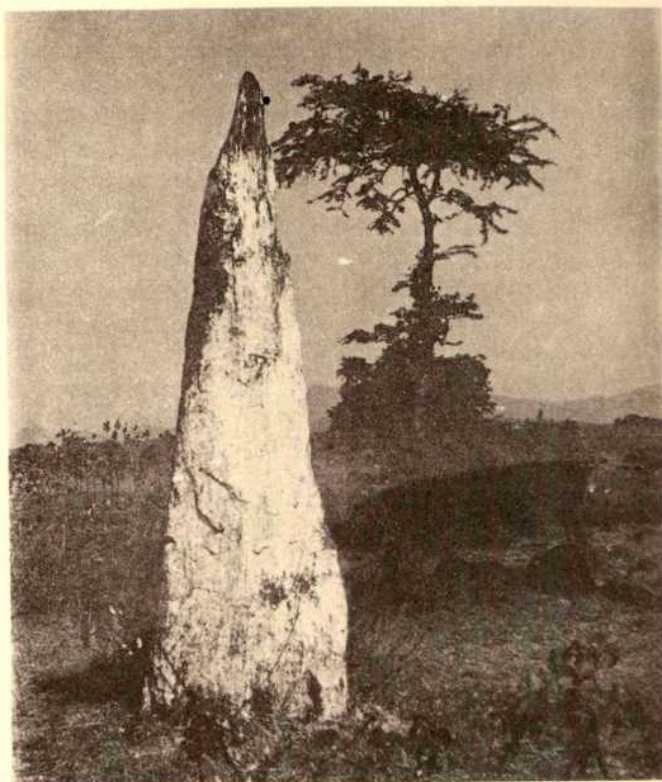


Fig. 6: Thirumalavadi: Menhir placed in the middle of a cairn circle

exceptions both the cists and dolmens always faced east.

Cairn Circle: This major burial type had five sub-types:

1. cairn circle enclosing cist burial
2. cairn circle enclosing urn burial
3. cairn circle with double circle enclosing cist burial
4. cairn circle with menhir
5. cairn circle enclosing sarcophagus

The cairn circles were constructed using round boulders with cairns at the centre. As noted above their height above the ground depended upon the nature of the burial and to some extent the terrain. The diameter of the circle varied according to the contents. Cairn circles enclosing urns were 3-8 m in diameter whereas those with cist burials were 10-25 m in diameter.

Cist Burial: The cist is a box-like structure constructed from four orthostats, arranged clockwise or anti-clockwise on the ground and covered by a capstone. This square cist has, on its eastern side, either a round or a trapeze-shaped porthole. Excavation of these burials would help us to further classify them. However, close observation of a few disturbed cists reveals that the cists were not generally divided further to form a transepted variety, and only in a few cases, were passages observed in front of the cist.

Urn Burial: Urn burials were placed in a pit and covered with a capstone. Then the whole structure was covered by cairn packing encircled with boulders. The major concentration was noticed in Harur taluka. The urns were uniform in

shape having a wide mouth, bulbous or globular body and conical base. The rims were rolled and heavy. They were made of an ill-fired coarse Red Ware. The urn was placed either upright or at a slant inside a shallow or trough-shaped pit. Skeletal remains were found inside the urn and a number of small pots were arranged around the base of the urn.

Double Circle: Sites like Ittikal Agaram and Kuruvinaayanapalli yielded double-circle burials. The inner circle comprised boulders whereas the outer one was constructed from slabs placed vertically around the inner circle at regular intervals, projecting 10-20 cm above the ground level. Interestingly, these double circles occurred only in cist burials. Cairn circles containing urn burials did not have them.

Menhir: A cairn circle with a tapering, monolithic side slab rising to a height of 3.25 m was noticed at only one site Thirumalavadi (Fig. 6).

Sarcophagus: A damaged sarcophagus is presently housed in the State Archaeology Museum, Dharmapuri. This trough-shaped sarcophagus, of ill-fired coarse Red Ware, has two rows of legs. Unfortunately the discoverer has not recorded whether it was buried in a cist or a pit.

Dolmen: Another major type of burial, confined mainly to the Krishnagiri taluka, had the following sub-types:

1. simple dolmen
2. dolmen encircled by a single or multiple circles of slabs
3. dolmen with passage

Here, the so-called dolmenoid cist may also be brought within the purview of the dolmen, for the simple reason that the dolmenoid cists really represent nothing but another sub-type of the dolmen. Any sepulchral architecture raised above the level of the ground may be considered a dolmen. Sites like Mallachandiram, Channachandram, Maharajakadai, Mungilpudur, etc. yielded this sub-type in the midst of a large number of dolmens. Nowhere has a dolmenoid cist been identified as a separate entity. On a few occasions scholars also labelled some of the cists exposed partially (due to the removal of the enclosing cairn) as dolmenoid cists. In such cases, the present writer has classified them as cists.

At Maharajakadai and Mallachandiram a peculiar type of dolmen was found raised on the rocky surface of the hill top. However, as this dolmen was closely encircled by slabs and stone blocks, it is described here as a dolmenoid cist. However, this dolmenoid cist is nothing but an elaborate architectural feature of the dolmen. Except for one example all the dolmens were located on hill tops.

Simple Dolmen: This variety has four orthostats placed either clockwise or anti-clockwise to form a box-like structure with a round porthole on the east. It invariably rests on the ground, and the whole is covered by a capstone.

Dolmen with Passage: In addition to the above structural features of the dolmen, in some cases a passage is noticed in front of the porthole, i.e. on the eastern side. These passages were either made up of two vertical slabs placed on either side of the porthole or of small triangular slabs placed in four to five courses to form a wall-like structure on either side of the porthole. This was closed by another vertical slab at its eastern end. Generally the passage lies between the dolmen and the circle.

Dolmen with a Circle of Slabs: This structure is characterized by a rectangular circle of slabs like a wall or stone railing, either continuous or at regular intervals or at the four cardinal points. Sometimes there is more than one circle. In this case, the outer circle is smaller in height than the inner circle. The whole structure looks like a fortification wall. To avoid any inward or outward collapse of the vertical slabs or orthostats, rectangular brick shaped stone blocks were placed in a number of rows in the gap between the circle of slabs and the dolmen, covering half of the dolmen.

Another variant of the above has a single or double circle of slabs. The slabs of the inner circle rise 150 cm above the height of the dolmen. In each circle, slabs with rectangular or flat tops and slabs with semi-circular tops always occupy the cardinal points (Fig. 7). The slab standing against the eastern orthostat of the dolmen also had a round porthole identical to the porthole of the dolmen. Generally this elaborate dolmen was surrounded by a number of small dolmens placed at regular intervals. This particular kind of dolmen may have been constructed for an important person.

Porthole: Except in two cases the dolmen as well as the cist almost invariably have a porthole on the eastern orthostat. The exceptions are at Tograpalli and at Pattakapatty, both in Krishnagiri taluka, where the porthole was found on the western side. Three types of portholes namely trapezoid, round and 'U'-shaped were observed.



Fig. 7: Mallachandiram: View of the dolmen

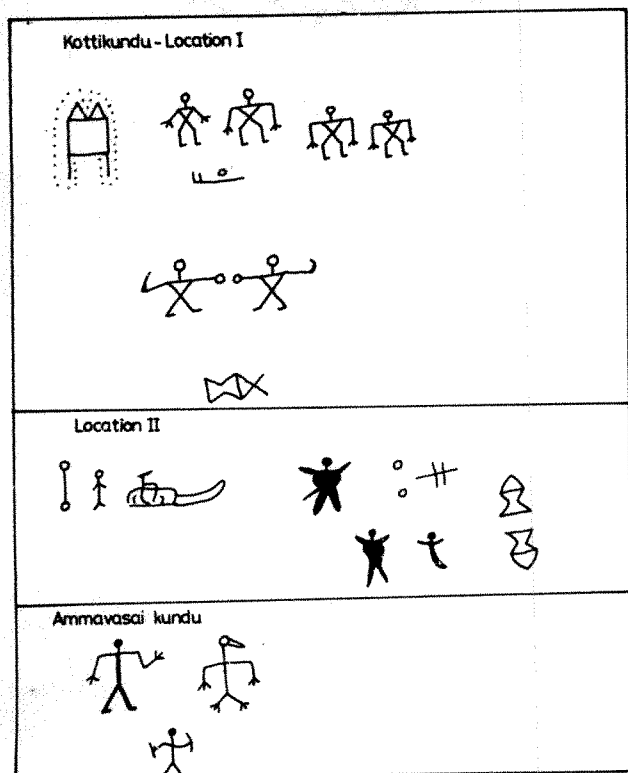


Fig. 8: Thalapalli rock shelter: paintings

The trapeze-shaped porthole was noticed only in the northwestern part of Dharmapuri District particularly in the Kaveri basin. The round porthole was invariably noticed in the dolmen and sometimes in the cist burial also. The frequency of occurrence of the round porthole in the cist and its geographical distribution are yet to be assessed.

The 'U'-shaped porthole was always observed on the upper part of the eastern orthostat. This is seen in addition to the usual round/trapeze-shaped porthole of the cist scooped out at the centre of the orthostat. This type is reported from Pachchihanapalli, Malthampatti, Pattakapatty, Udedurgam, Bodampatti, etc.

Capstone with Cup marks: Capstones with cup marks on their upper surface have been reported from Vedarhattakkal, Anachandram and Karubayanahalli.

Local Names

The Megaliths are locally called *pandiyarvidu*, *panduvuravidu*, *panduvurarkuddai*, *panduvaramokkai*, *panduvurarkaradu*, *pandiyankuli*, etc. suggestive of their association with the *Pandavas* of the Mahabharata. At Palaguri the Megalithic graveyard is called *chettakuttai* meaning 'mound of the dead'.

Rock Paintings

The rock paintings in this area fall into two categories, those found on the ceilings of rock shelters and those on the

dolmens. Examples of the first group are found at Thalapalli (Fig. 8), Oppathavadi (Figs. 9 and 10), Oramanakunta (Fig. 11), Myiladumparai (Figs. 12, 13 and 14), Mallapadi, etc., in Krishnagiri taluka and at Mudippinayanapalli in Hosur taluka. The second group is found at Mallachandiram (Fig. 15), Maharajakadai (Fig. 16), Malthampatti, Kuruvina-anapalli (Fig. 17), Oramanagunta (Figs. 18 and 19), etc.

The paintings are invariably executed by using both white and red pigments. At Myiladumparai and Oramanagunta the white pigment is superimposed on red pigment thereby indicating an earlier date for the paintings done in red which may date from the Neolithic period. The absence of red pigment in the Megalithic burials also suggests an earlier date for these paintings. These were executed at different times and in various locations of the same shelter. The non-occurrence of any habitation material at these sites suggests that the rock shelters were painted for special occasions. The motifs painted on the dolmens and the rock shelters closely resemble each other. The paintings on the dolmens have more human figures than animal figures and fighting scenes. There are two types of line drawings. One type shows just a figure or symbol drawn with a single line while the other is made up of triangular figures.

While applying paint on the interior surface of the dolmen the Megalithic builders always gave first preference to the western orthostat. If that orthostat had been exhausted

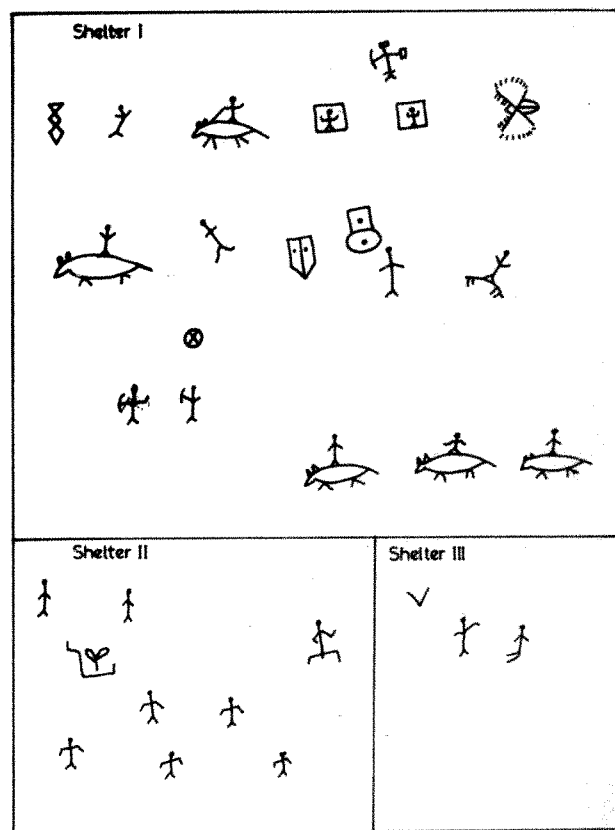


Fig. 9: Oppathavadi rock shelter: paintings

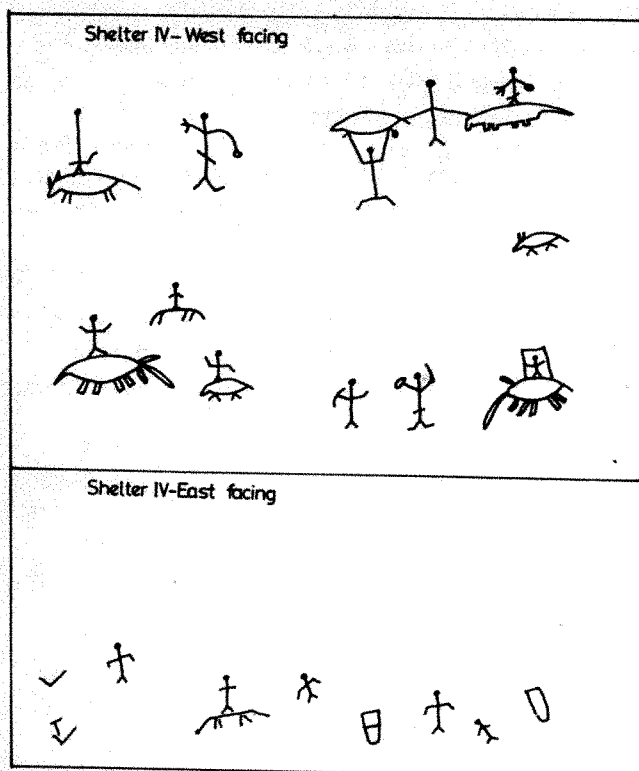


Fig. 10: Oppathavadi rock shelter: paintings

then they chose (again in order of preference) the northern, southern and finally the eastern orthostats. Generally, the paintings were seen only on the western orthostats.

A variety of scenes have been depicted, among them are rows of dancers, a man with cattle, (?) a horse rider, warriors and the tilling of land. In a few cases the figure of a man is shown pointing his bow and arrow upwards. Generally, however, men with bows and arrows are shown confronting each other. This recalls the sculptural panels of the herostones of the Historical period found in the area. In one instance, warriors on horseback (?) are depicted. The men have a shield in one hand and the reins of the horse in the other. Sometimes they are also shown holding a long unidentified lance-like object.

In one painting a plant is seen emerging out of a square base recalling the rail and tree symbol of punch marked coins. While depicting dance scenes the figures are almost always drawn in a row. In one case a house has been drawn in front of a row of four dancing figures.

Interestingly, the painting at Kuruvinyanapalli had a symbol where 12 square boxes have been formed by 5 vertical and 4 horizontal lines. Out of the five vertical strokes the inner three strokes end in arrow marks. Four human figures are also depicted, two each on either side of this symbol. In another, two human figures along with an animal are also depicted. The central box with arrow marks is similar to the symbols depicted on fertility stones locally called *Sanniyasi Kal*. The animal depicted on one side of this

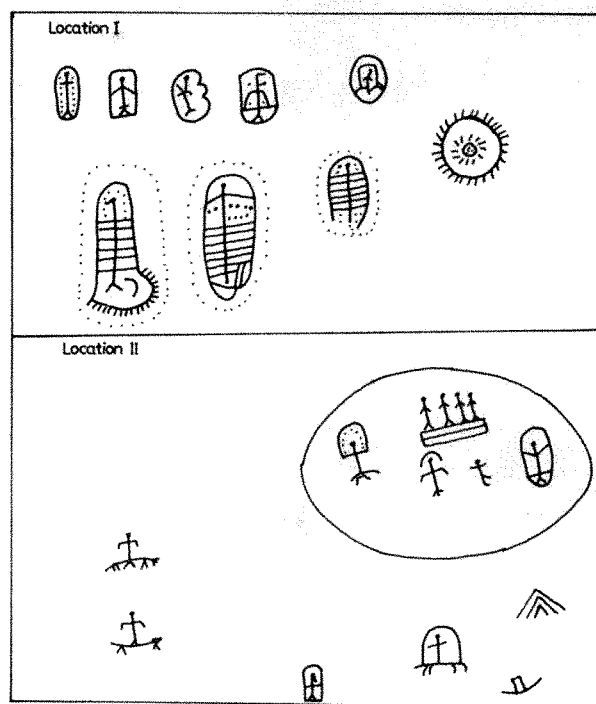


Fig. 11: Oramanagunta rock shelter: paintings

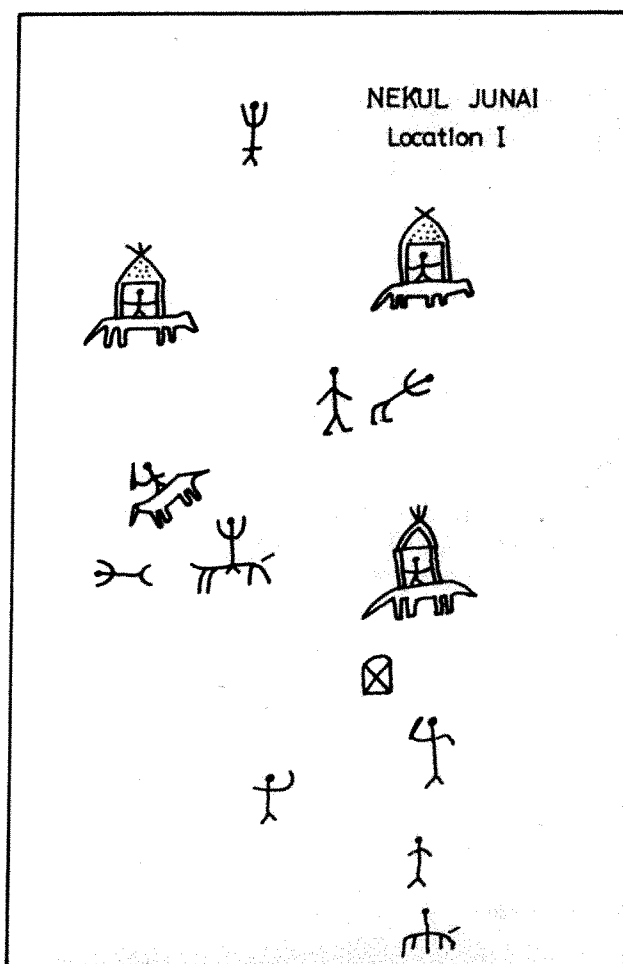


Fig. 12: Mayiladumparai rock shelter: paintings

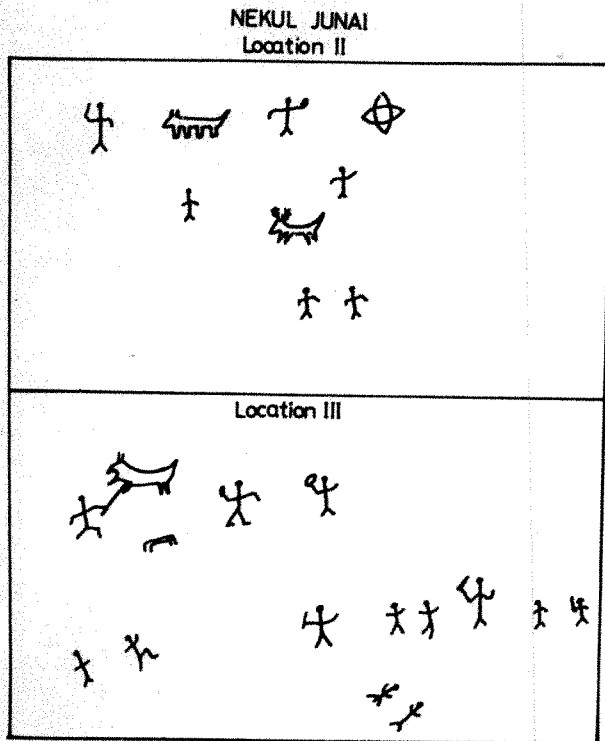


Fig. 13: Mayiladumparai rock shelter: paintings

box may be a symbolic representation of the animal allowed to cross the symbol to increase fertility. Other symbols like stars, human genitals, flower motifs, circles with a dot, etc., were also depicted.

At Maharajakadai almost all the paintings found on the dolmens have been vandalised. Most of them were drawn on and written on by the local people using the same white paint prepared from the locally available raw materials. The

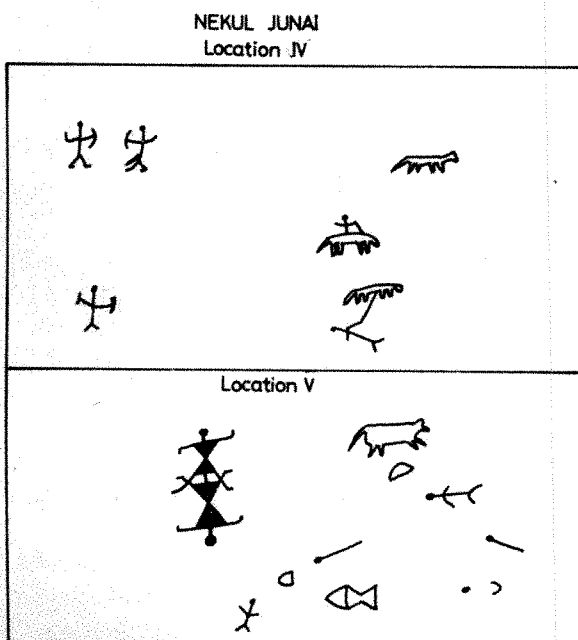


Fig. 14: Mayiladumparai rock shelter: paintings

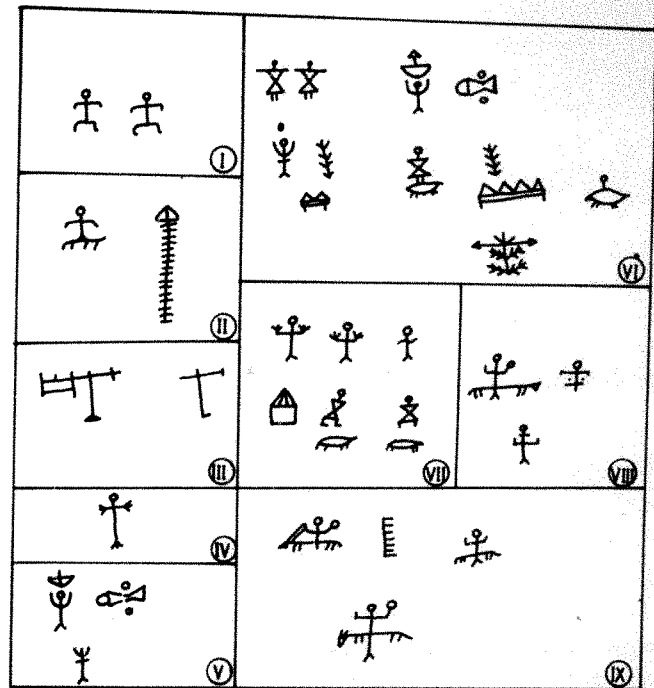


Fig. 15: Mallachandiram dolmen paintings

rock shelter paintings, however, were left untouched.

Rock shelters with paintings are found in the vicinity of the Megalithic graves. The observed similarities between the motifs and themes depicted on the rock shelters and on the inner surfaces of the dolmens are indicative of their association with the Megalithic builders. Interestingly, the rock paintings discovered so far are also confined to the region where the dolmens are available. Thus the close resemblance

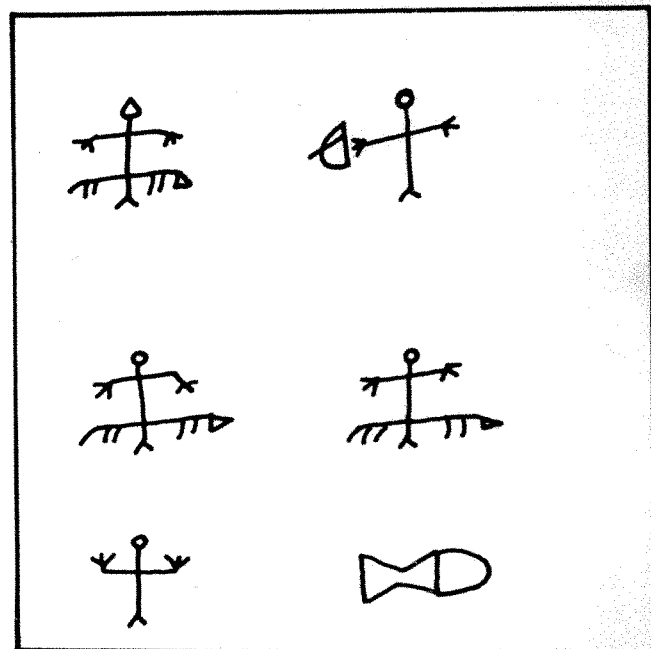


Fig. 16: Maharajakadai dolmen paintings

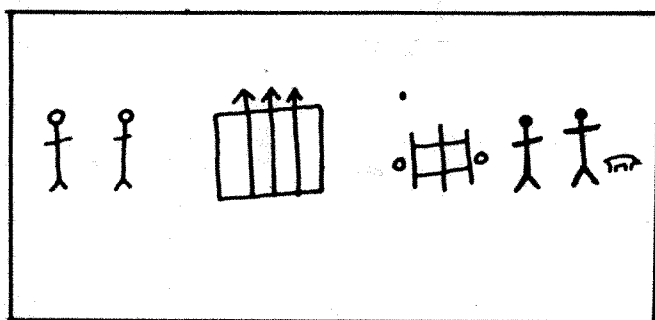


Fig. 17: Kuruvinayanapalli dolmen paintings

in tone and tenor between the paintings on dolmens and those in the rock shelters would establish their contemporaneity.

It is generally believed that the rock paintings belong to the prehistoric period. Unlike other regions, the earliest rock paintings in red pigment were perhaps of the Neolithic period. However, as noted above out of ten sites only two sites have yielded paintings of an earlier period, all the others belong to the Megalithic period.

Chronology

In the absence of ^{14}C dates for the cultural material found in the habitation deposits and burials of this region, it is not possible to arrive at a satisfactory chronology for this culture only on the basis of a comparative study with other dated sites.

From the available evidence it seems that the Megalithic culture can be dated to a period anywhere between

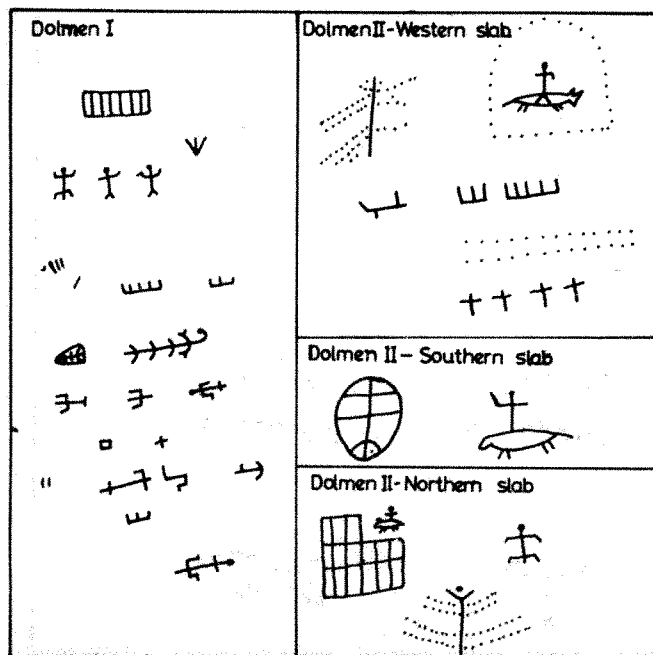


Fig. 18: Oramanagunta dolmen paintings

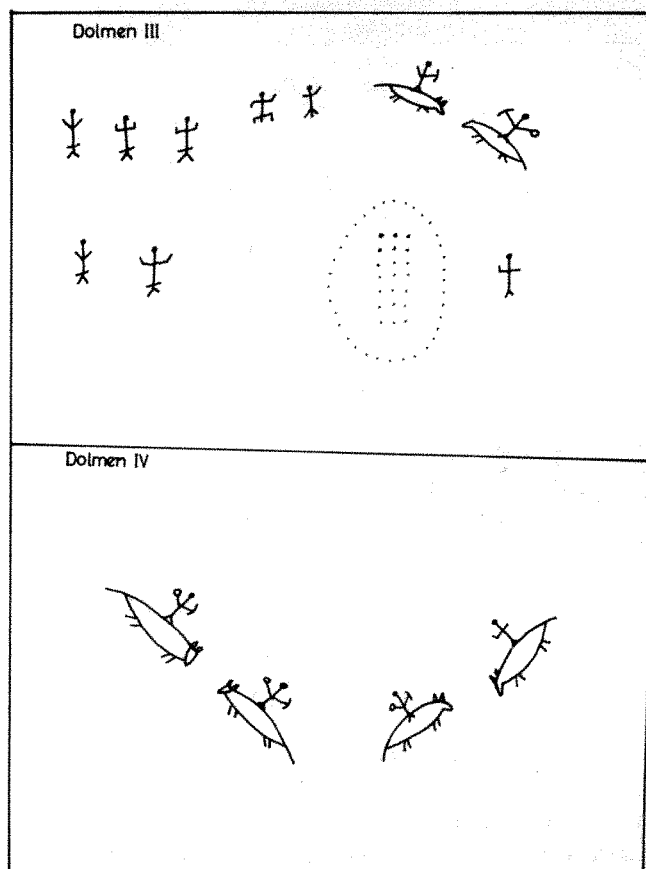


Fig. 19: Oramanagunta dolmen painting

1000 B.C.-A.D. 100. As one moves from the Krishna basin in north Karnataka towards Tamil Nadu it becomes clear that the Megalithic burial practices in the latter region have a close affinity with the former region and that the Megaliths of Tamil Nadu are of a younger age.

As noted earlier, the transested cist might have developed somewhere between Brahmagiri and Kollegal before being introduced into the Coimbatore region via the Dimbam pass and the Moyar valley. The transested variety was noticed at Parasagowdanapalyam, Bailur, Gundi Malla, Kallidoddi, Martalli, etc., in Kollegal taluka. These transested cists can be dated to the 5-4th centuries B.C. and in the Noyyal river valley in Coimbatore which is to the south of Dharmapuri, they are dated to the 3rd century B.C. It is likely therefore that this type was introduced into the Dharmapuri region around 400 B.C.

On the basis of the above discussion one can safely place the beginning of the Dharmapuri Megalith culture to c. 4th century B.C. The occurrence of a silver punch-marked coin and a Roman coin at Navalai, the graphic reference to Megaliths in early Tamil (Sangam) literature, the emergence of herostones as memorials in place of Megaliths all suggest a terminal date for these Megaliths around the 1st century A.D.

It is clear from the foregoing account that the present study incorporating surface collections and a topographical study are still inadequate to arrive at a comprehensive picture of the Megalithic culture of this region. Systematic excavation of a habitation-cum-burial site and dating of the different types of burials is essential for any further progress in this sphere of research.

Conclusion

A number of theories have been proposed by various scholars regarding the origin and diffusion of the Megalithic culture. Without going into details, it can reasonably be said that the Tamil Nadu Megalithic cemeteries appear to be a developed complex incorporating several streams of influence.

The extensive survey carried out in recent years by A. Sundara (1975) in north Karnataka has given us a fairly comprehensive picture of the development of various types of Megaliths in South India. He is of the opinion that two different Megalithic building traditions emerged in the north Karnataka region. The first, originating in the Malaprabha valley, was the trapezoidal variety of the Konnur type which developed into the Brahmagiri type, with a porthole in the eastern orthostat. The second variety is characterized by a hexagonal passage chamber called the Kaladgi type and originated in the Ghataprabha valley. It developed into an oblong chamber with a porthole in any orthostat at Rajankolur in the Krishna valley. At Hire Benkal, in the Tungabhadra valley, further modifications took place. The Hire Benkal types are oblong in plan without the passage. A circle of vertical slabs completely encloses the chamber and sometimes the slabs rest against the capstone. Narasimhaiah is of the opinion (1980) that the Brahmagiri and Hire Benkal types were the main influence in Tamil Nadu.

The cairn circles with cist burials found in the Kaveri valley have a close affinity with the Megaliths of the Mysore and Mandya districts of south Karnataka.

The dolmens with round portholes on the east seen in the northern part of Krishnagiri taluka and east of Markandandadi might have been introduced from the Kolar district in Karnataka and Chittoor district in Andhra Pradesh via the Kuppam and Tiruppattur passes.

The dolmens as seen at Iralabanda (Branfill 1880), Kavalagunta, Midimalla, Govindareddipalli (Rao 1988) all in the Chittoor district of Andhra Pradesh, were either encircled by vertical slabs or had arched roofs, and may be the forerunners of those at Mallachandiram and Maharajaka-

dai. Interestingly at Iralabanda as at Mallachandiram all the three vertical slabs are placed against round portholes. In the same manner, the anthropomorphic stone figure found against the porthole as a part of the circle of slabs discovered at Midimalla, also in Chittoor District, appears to be similar to the Mottur anthropomorphic figure reported earlier. These similarities suggest a close link between the dolmens of Krishnagiri taluka and those of Chittoor District.

Cairn circles containing urns are found predominantly in Harur taluka. The sarcophagus burial found in Dharmapuri District may be indigenous, or might have been subject to influences from the neighbouring South and North Arcot Districts along the river Pennaiyar.

Acknowledgments

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Table 2: List of archaeological sites in Dharmapuri District

Sr. No.	Sites	Talukas	Nature of sites	Artefacts
1.	Achchalvadi	Harur	Cairn circle, memorial stone (10)	
2.	Adanur	Pennagaram	Habitation mound, cairn circle (10), memorial stone (1)	
3.	Addakuddai	Dharmapuri	Cairn circle (40)	
4.	Addaoni	Pennagaram	Cairn circle (10)	
5.	Adikarapatty	Harur	Cairn circle (10)	
6.	Adiyamankottai	Dharmapuri	Habitation mound	
7.	Agalakottai	Denkanikottai	Memorial stone (1)	
8.	Agraharam .B	Dharmapuri	Memorial stone (1)	
9.	Alamelupuram	Harur	Memorial stone (2)	
10.	Anachandram	Hosur	Cairn circle (10), capstone had cup marks	
11.	Anandur	Uttangarai	Memorial stone (1)	
12.	Andimalai	Krishnagiri	Cairn circle (4), rock paintings	
13.	Arakasanahalli	Pennagaram	Cairn circle (20)	
14.	Attakuddai	Krishnagiri	Rock paintings	
15.	Attanur	Krishnagiri	Cairn circle enclosing urn burial (50)	
16.	Ayyur	Denkanikottai	Cairn circle (20)	
17.	Bairamangalam	Denkanikottai	Memorial stone (1)	
18.	Balajangamanahalli	Dharmapuri	Cairn circle (20)	
19.	Balamarandahalli	Palacode	Memorial stone (1), <i>Sanniyasi Kal</i> (1)	
20.	Balanapalli	Hosur	Cairn circle (23)	
21.	Balanayanapalli	Krishnagiri	Cairn circle (50)	
22.	Baleguli	Krishnagiri	Megaliths (20)	
23.	Bannellipudur	Krishnagiri	Cairn circle (50)	
24.	Bargur	Krishnagiri	Neolithic, cairn circle (10)	
25.	Belur	Denkanikottai	Cairn circle (100), memorial stone (1)	
26.	Bettamugulalam	Denkanikottai	Cairn circle (100)	
27.	Bhastharapalli	Hosur	Dolmen (4)	
28.	Bilalam	Denkanikottai	Cairn circle (10)	Neolithic celt
29.	Bodampatti	Denkanikottai	Cairn circle (10)	
30.	Chandramalai	Uttangarai	Cairn circle (10)	
31.	Chandrapoor- thapparai	Krishnagiri	Dolmen (60)	
32.	Cekkarapatty	Dharmapuri	Cairn circle (50), memorial stone (1), <i>Sanniyasi Kal</i> (1), <i>Kovukkal</i> (1)	
33.	Chellampatti	Harur	Memorial stone (2)	
34.	Chennachandiram	Krishnagiri	Habitation mound, dolmen (20), memorial stone (1)	
35.	Chettihalli. P	Palacode	Cairn circle (20)	
36.	Chettipalli. A	Hosur	Cairn circle (50)	
37.	Chinnakadamadai	Pennagaram	Cairn circle (20)	
38.	Chinnakuppam	Harur	Memorial stone (2)	
39.	Dailmalai	Harur	Neolithic, habitation mound	Microoliths of Neolithic period
40.	Devarmukkulam	Krishnagiri	Cairn circle (50), memorial stone (1)	
41.	Doddamanchi	Denkanikottai	Cairn circle (6)	
42.	Doddattimmanahalli	Denkanikottai	Dolmen (10), cairn circle (10)	
43.	Echchanahalli	Denkanikottai	Cairn circle (10)	
44.	Ekalnattam	Krishnagiri	Dolmen (20)	
45.	Elattagiri	Krishnagiri	Memorial stone (5)	
46.	Ellapuliampatti	Harur	Cairn circle (200), memorial stone (1)	
47.	Elumichchanahalli	Palacode	Cairn circle (10)	

48. Enusonai	Hosur	Cairn circle (3)	
49. Eriyur	Pennagaram	Cairn circle (20)	
50. Erupalli	Pennagaram	Memorial stone (1)	
51. Gangadevanahalli	Denkanikottai	Cairn circle (10), menhir (7 ft.), memorial stone	
52. Gangaleri	Krishnagiri	Dolmen (5), cairn circle (20)	
53. Gangavaram	Krishnagiri	Cairn circle (20), memorial stone (3)	
54. Gidlur	Krishnagiri	Cairn circle (100)	
55. Gollapalli	Krishnagiri	Neolithic ?, habitation mound, megaliths (10)	
56. Gopinathampatti R	Harur	Cairn circle enclosing urn burial (200)	
57. Gummanur	Denkanikottai	Cairn circle (10)	
58. Gunduvalam	Hosur	Cairn circle (15)	
59. Halepuram	Pennagaram	Memorial stone (1)	
60. Indiranagar	Harur	Cairn circle enclosing urn burial (200)	
61. Irumattur	Krishnagiri	Cairn circle (50)	
62. Ittikal Agaram	Krishnagiri	Cairn circle (50)	
63. Jammanahalli	Harur	Cairn circle (50)	
64. Kadattur	Harur	Neolithic, habitation mound, cairn circle (20)	Punch-marked coins
65. Kailavaram	Harur	Memorial stone (1)	
66. Kallavi	Uttangarai	Habitation mound	
67. Kanampatti	Uttangarai	Memorial stone (1)	
68. Kanappanur	Harur	Memorial stone (1)	
69. Kanavanapalli	Denkanikottai	Cairn circle (8)	
70. Kanavapatti	Krishnagiri	Memorial stone (1)	
71. Kande-			
kavundanahalli	Denkanikottai	Cairn circle (9)	
72. Kappalavadi	Krishnagiri	Palaeolithic	
73. Karigaundanur	Krishnagiri	Cairn circle (10)	
74. Karubayanahalli	Dharmapuri	Cairn circle (50), memorial stone (1), capstone had cup marks	
75. Karumariam-			
mankoil	Pennagaram	Cairn circle (50)	
76. Karuvanoor	Uttangarai	Cairn circle (10)	
77. Kathirampatti	Harur	Memorial stone (2)	
78. Kerekodihalli	Harur	Memorial stone (1)	
79. Kesaruhalli	Palacode	Memorial stone (1)	
80. Kodalpatti	Pennagaram	Cairn circle (20)	
81. Kodugur	Krishnagiri	Cairn circle (20), memorial stone (1)	
82. Kolahattur	Dharmapuri	Cairn circle (10), habitation mound	
83. Kolkottur	Krishnagiri	Cairn circle (20)	
84. Kondalmaduvu	Harur	Memorial stone (1)	
85. Kondampatti	Uttangarai	Memorial stone (1)	
86. Korakurki	Hosur	Cairn circle (10)	
87. Kotrampatty	Harur	Memorial stone (1)	
88. Kottur	Denkanikottai	Cairn circle (2)	
89. Kuchchukalpattur	Krishnagiri	Megaliths, memorial stone (1)	
90. Kudalur	Harur	Memorial stone (1)	
91. Kuddapatti	Krishnagiri	Memorial stone (1)	
92. Kukkadappatti	Harur	Memorial stone (1)	
93. Kullankottai	Harur	Cairn circle (100)	
94. Kundukottai	Denkanikottai	Cairn circle (10)	
95. Kunnattur	Uttangarai	Cairn circle (50)	
96. Kunthapalli	Krishnagiri	Memorial stone (1)	
97. Kuntharapalli	Krishnagiri	Cairn circle (20)	
98. Kuppuchettipatti	Dharmapuri	Memorial stone (1)	
99. Kurampatti	Krishnagiri	Cairn circle (20)	

100.	Kurubarahalli	Hosur	Cairn circle (6)	
101.	Kurumpatti	Harur	Memorial stone (1)	
102.	Kuruppandoddi	Hosur	Megaliths (10)	
103.	Kuruvinayanapalli	Krishnagiri	Dolmen (10), rock paintings	
104.	Kuttalatti	Krishnagiri	Cairn circle (4), memorial stone (1), rock paintings	
105.	Kuttappadi	Pennagaram	Habitation mound, cairn circle (10), memorial stone (1)	
106.	Lakshachandram	Denkanikottai	Cairn circle (10)	
107.	Laligam	Dharmapuri	Cairn circle (10)	
108.	Maharajakadai	Krishnagiri	Dolmen (20), rock paintings	
109.	Maidandapalli	Hosur	Cairn circle (20)	
110.	Mallachandiram	Hosur	Dolmen (100), rock paintings	
111.	Mallikarjunadurgam	Denkanikottai	Cairn circle (10)	
112.	Malththampatti	Krishnagiri	Cairn circle (100)	
113.	Manchugondapalli	Denkanikottai	Cairn circle (5)	
114.	Maniyambadi	Harur	Cairn circle (20)	
115.	Manjanaicka- nampatti	Pennagaram	Cairn circle (100)	
116.	Marireddipalli	Krishnagiri	Neolithic, habitation mound, cairn circle (10)	
117.	Mariyalam	Denkanikottai	Cairn circle (2)	
118.	Marudepalli	Krishnagiri	Megaliths (10)	
119.	Marukkarampatti	Pennagaram	Cairn circle (50), habitation mound, <i>Jagani</i>	
120.	Mayiladumparai	Krishnagiri	Neolithic, habitation mound, cairn circle (500), rock paintings	
121.	Mekkanampatti	Dharmapuri	Cairn circle (10)	
122.	Melumalai	Hosur	Cairn circle (3)	
123.	Menasi	Harur	Memorial stone (1)	
124.	Meyyandipatti	Uttangarai	Memorial stone (1)	
125.	Mittapalli	Krishnagiri	Megaliths (10)	
126.	Modur	Dharmapuri	Neolithic, habitation mound, memorial stone (1), cairn circle enclosing urn burial (20)	Jain beads
127.	Mondukuli	Harur	Memorial stone (1)	
128.	Mookanur	Harur	Cairn circle (100)	
129.	Moolakkottai	Harur	Cairn circle enclosing urn burial (50)	
130.	Moongilpudur	Krishnagiri	Dolmen (50), cairn circle (50), rock paintings ?	
131.	Morappur	Harur	Cairn circle enclosing urn burial (50)	
132.	Mottur	Krishnagiri	Cairn circle (20), memorial stone (1)	
133.	Mudippinayanapalli	Hosur	Dolmen (10), rock paintings	Iron slag
134.	Mukkanur	Dharmapuri	Cairn circle (50), memorial stone (1)	
135.	Mullikadu	Harur	Neolithic, habitation mound	Microliths of the Neolithic period
136.	Mundachikal	Pennagaram	Memorial stone (2)	
137.	Muttanoor	Harur	Memorial stone (2)	
138.	Nadiyanur	Uttangarai	Memorial stone (1)	
139.	Naduchcheri	Pennagaram	Cairn circle (200), memorial stone (1)	
140.	Naduppatti	Uttangarai	Memorial stone (1)	
141.	Nagamangalam	Denkanikottai	Memorial stone (3)	
142.	Nagamangalam	Krishnagiri	Megaliths (10)	
143.	Nagarkudal	Dharmapuri	Cairn circle (50)	
144.	Nakkalapalli	Krishnagiri	Megaliths (10)	
145.	Nalapparampatti	Palacode	Cairn circle enclosing urn burial (100)	
146.	Nammandahalli	Denkanikottai	Cairn circle (23)	
147.	Narasipuram	Palacode	Memorial stone (1)	
148.	Naripalli	Harur	Memorial stone (1)	

149. Narttampatti	Dharmapuri	Cairn circle (20)	
150. Natarapalayam	Denkanikottai	Cairn circle (2), memorial stone (1)	
151. Nattapatti	Dharmapuri	Habitation mound, cairn circle (50), memorial stone (1)	
152. Nattenur	Harur	Cairn circle (20)	
153. Navalai	Harur	Cairn circle enclosing urn burial (200), habitation mound, memorial stone (1)	335 Punch-marked coins, Roman coin
154. Nerkunti	Dharmapuri	Habitation mound, cairn circle (100)	
155. Oblesapalli	Krishnagiri	Cairn circle (40)	
156. Oddampatti	Uttangarai	Memorial stone (1)	
157. Oddupatti	Harur	Memorial stone (1)	
158. Ondikottai	Pennagaram	Cairn circle (100)	
159. Oppattavadi	Krishnagiri	Rock paintings	
160. Oramanagunta	Krishnagiri	Cairn circle (10), dolmen (5), rock paintings	
161. Othikuppam	Krishnagiri	Dolmen (5), rock paintings	
162. Ottupallam	Harur	Memorial stone (3)	
163. Pachchihanapalli	Krishnagiri	Habitation mound, dolmen (100), cairn circle (1000), memorial stone (1)	Iron slag
164. Palaguri	Krishnagiri	Cairn circle (50)	
165. Palaiyamkottai	Denkanikottai	Cairn circle (10)	
166. Palanikuttai	Dharmapuri	Cairn circle (1000)	
167. Palavadi	Dharmapuri	Memorial stone (1), habitation mound	
168. Palaya Indur	Dharmapuri	Habitation mound, memorial stone (1)	
169. Panaikulam	Pennagaram	Habitation mound, memorial stone (1)	
170. Pangunattam	Dharmapuri	Cairn circle (100)	
171. Pannapatti	Pennagaram	Cairn circle (1000), cattle raising, <i>Jagani</i>	
172. Pannimaduvu	Harur	Neolithic	
173. Pappampadi (Irulapatti)	Harur	Memorial stone (1)	
174. Parandur	Hosur	Memorial stone (1)	
175. Pattakapatti	Krishnagiri	Cairn circle (200)	
176. Peddatalapalli	Krishnagiri	Memorial stone (1)	
177. Periyapannimaduvu	Harur	Memorial stone (1)	
178. Periyapompatti	Uttangarai	Memorial stone (1)	
179. Perumbalai	Pennagaram	Habitation mound, cairn circle (50), memorial stone (1)	
180. Pidehanahalli	Hosur	Memorial stone (1)	
181. Poompallam	Palacode	Cairn circle enclosing urn burial (50)	
182. Pottankottai	Uttangarai	Memorial stone (1)	
183. Pudanattam	Harur	Memorial stone (1)	
184. Pudupatti	Pennagaram	Cairn circle (20)	
185. Pudur	Dharmapuri	Cairn circle (100)	
186. Pudur	Harur	Cairn circle (10)	
187. Puliyanoor	Uttangarai	Memorial stone (1)	
188. Puram	Hosur	Cairn circle (10)	
189. Rajagollahalli	Dharmapuri	Memorial stone (1), cairn circle (200), habitation mound	
190. Rajakuddai	Palacode	Cairn circle (100)	
191. Rajathoppu	Dharmapuri	Cairn circle (20)	
192. Ramakrishnampati	Uttangarai	Memorial stone (1)	
193. Ramayanahalli	Harur	Cairn circle (20)	
194. Rangasamymalai	Pennagaram	Cairn circle (10)	
195. Ratnagiri	Denkanikottai	Cairn circle (8)	
196. Rayakottai	Denkanikottai	Cairn circle (10)	
197. Reddiyur	Uttangarai	Memorial stone (1)	

198.	Samandahalli	Harur	Cairn circle (500)	
199.	Santhanapalli	Denkanikottai	Cairn circle (10), memorial stone (10)	
200.	Sappamuttulu	Krishnagiri	Cairn circle (100)	
201.	Sembadamuttur	Krishnagiri	Cairn circle (10)	
202.	Sengodachenna- nahalli	Denkanikottai	Cairn circle (3)	
203.	Senkuttai	Harur	Cairn circle (1000)	
204.	Sevvampatti	Krishnagiri	Memorial stone (1)	
205.	Sikaralapalli	Hosur	Cairn circle (10)	
206.	Sivasubramania	Nagar	Dharmapuri Cairn circle (50)	
207.	Sokadu	Krishnagiri	Megaliths (10)	
208.	Soolagiri	Hosur	Cairn circle (25), memorial stone (1)	
209.	Sulamalai	Krishnagiri	Dolmen (10)	
210.	Suligunta	Denkanikottai	Cairn circle (5)	
211.	Sundekuppam	Krishnagiri	Habitation mound, rock paintings	
212.	Tammattakal	Dharmapuri	Cairn circle (20)	
213.	Tandarai	Denkanikottai	Cairn circle (5), memorial stone (1)	
214.	Tenkaraikottai	Harur	Cairn circle enclosing urn burial (10), habitation mound	
215.	Thadikallu	Denkanikottai	Cairn circle (20)	
216.	Thalanattam	Harur	Cairn circle (10), habitation mound	
217.	Thalapallam	Pennagaram	Memorial stone (1)	
218.	Thalapalli	Krishnagiri	Dolmen (20), rock paintings	
219.	Thathampatti. P	Harur	Cairn circle (10)	
220.	Thavalam	Krishnagiri	Cairn circle (50), memorial stone (1)	
221.	Thirumulavadi	Palacode	Cairn circle (100), menhir, memorial stone (1), <i>Sanniyasi Kal</i> (1)	
222.	Timijepalli	Denkanikottai	Cairn circle (10), memorial stone (1)	
223.	Tinnahalli	Harur	Memorial stone (1)	
224.	Tippampatti	Harur	Cairn circle (100)	
225.	Tippanapalli	Krishnagiri	Memorial stone (1)	
226.	Togarapalli	Krishnagiri	Neolithic site, habitation mound, memorial stone (15), cairn circle (50)	Microliths of the Neolithic period
227.	Torapalli	Hosur	Dolmen (4)	
228.	Tottikuppam	Denkanikottai	Neolithic, cairn circle (10)	
229.	Uddanapalli	Hosur	Cairn circle (50)	
230.	Udedurgam	Denkanikottai	Cairn circle (20)	
231.	Ullatti	Hosur	Megaliths (10)	
232.	Uttamalai	Pennagaram	Cairn circle (100)	
233.	Varasandiram	Krishnagiri	Memorial stone (1)	
234.	Varatanampatti	Krishnagiri	Dolmen (5)	
235.	Varatanpatti	Nattamedu	Uttangarai Memorial stone (1)	
236.	Varattanapalli	Krishnagiri	Palaeolithic	
237.	Vedarthattakkal (Sandur)	Krishnagiri	Habitation mound, cairn circle (200), memorial stone (7), cap stone had cup marks, Neolithic	
238.	Velampatti	Uttangarai	Cairn circle enclosing urn burial (10)	
239.	Vellalapatti	Uttangarai	Memorial stone (1)	
240.	Venkatapuram	Uttangarai	Memorial stone (1)	
241.	Viramalai	Krishnagiri	Megaliths (10)	

Rangpur Seal — Probable Egyptian Connection of the Harappan Civilization

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Abstract

The seal under discussion was found at the site of Rangpur in Saurashtra. It is round, made of steatite and bears motifs on both sides but no script. It is more in the nature of a seal-amulet as the rim is pierced so that it can be suspended on a string. The figures on it consist of a coiled snake, Apis-like bulls and a throne or chair suggestive of Egyptian influence. The author discusses the probable Egyptian connection of the seal and draws the attention of scholars to a potential line of research.

Introduction

Seals constitute one of the largest groups of finds from excavated Harappan sites. However, the non-decipherment of the script on them renders it difficult to interpret their archaeological importance. Variations in the sizes and shapes of seals do not contribute to our knowledge of their function. Identical seals are rare, though pictorial engravings on the seals do contain certain similar themes like the depiction of unicorns and of animals such as the bull. Rectangular and square seals are more numerous than round or button seals and pictorial seals with short inscriptions appearing on their upper margins are also common. Again, steatite seals are more common than seals and sealings made of other materials. The seal from Rangpur found by the author is made of steatite and is round in shape. It has motifs on both sides, and is perforated so that it can be suspended on a string. It does not, however, bear any inscription.

Rangpur Seal

Rangpur, in Surendranagar District, Gujarat, has been excavated several times, the earliest investigation having been carried out in 1934-35 by M.S. Vats (Vats 1936). Subsequently, small-scale excavations were conducted in 1936 by G.S. Ghurye (1936), by M.G. Dikshit in 1947 (Dikshit 1950) and between 1953 and 1956 by S.R. Rao (1963a). No seal was found in any of these excavations.

During this author's visit to Rangpur in September 1989, a circular seal of steatite, was found in a pit near the village of Rangpur. As this seal has been recovered from an

unstratified context, it is difficult to indicate its chronological position. However, it is well known that the Harappans did have trading relations with the countries of West Asia in the later part of the mature Harappan phase, which at Rangpur is coeval with Rangpur period IIA. This is further confirmed by evidence from Kuntasi, a Harappan port on the Gulf of Kutch dating back to 2,200 B.C. culturally and comparable to Rangpur IIA.

The Rangpur seal is circular in shape, about 35 mm in diameter, about 4 mm thick and has engravings on both sides. It has a deep groove running along the border on both sides. There are two perforations along the rim to facilitate the insertion of a string, so that the seal can be worn around the neck as an amulet (Fig. 1).

Discussion

On one side of the seal there are impressions of two bull-like creatures which are featured one above the other (Fig. 2). Each of these figures has four legs, a tail and a longish neck tapering to form a featureless head. A peculiarity of one of these animals is the existence of a horn-like projection on the head, like that of the Apis bull of Egyptian origin. In addition to the two animals in the centre of the seal, there are coiled snakes extending along the remaining portion of the same side of the seal. In fact, on the left side of the upper figure, there appears to be the hood of a snake (Fig. 2).

The figure on the reverse side is difficult to identify because of the faded grooves on the inner portion of the seal. It is possible that this side had been used more frequently

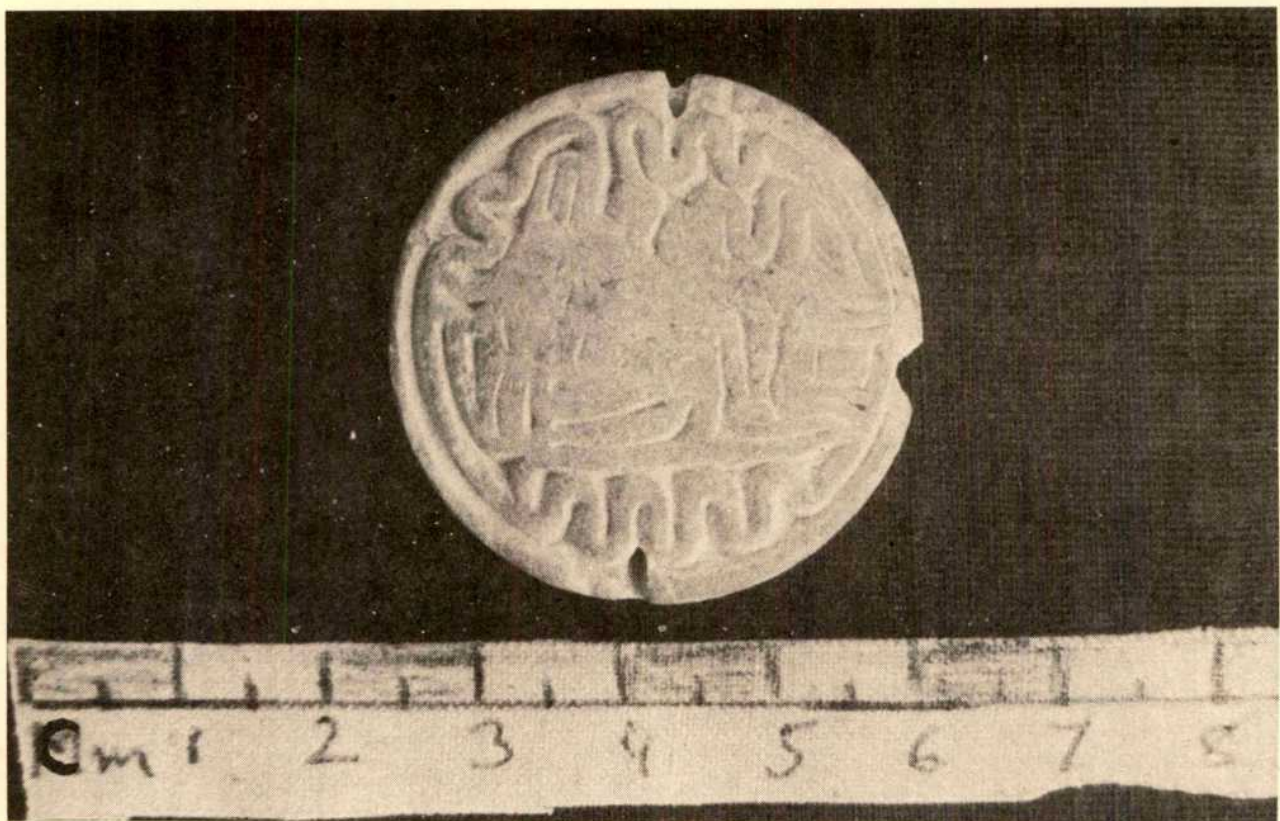


Fig. 1: Rangpur seal showing perforations along the rim

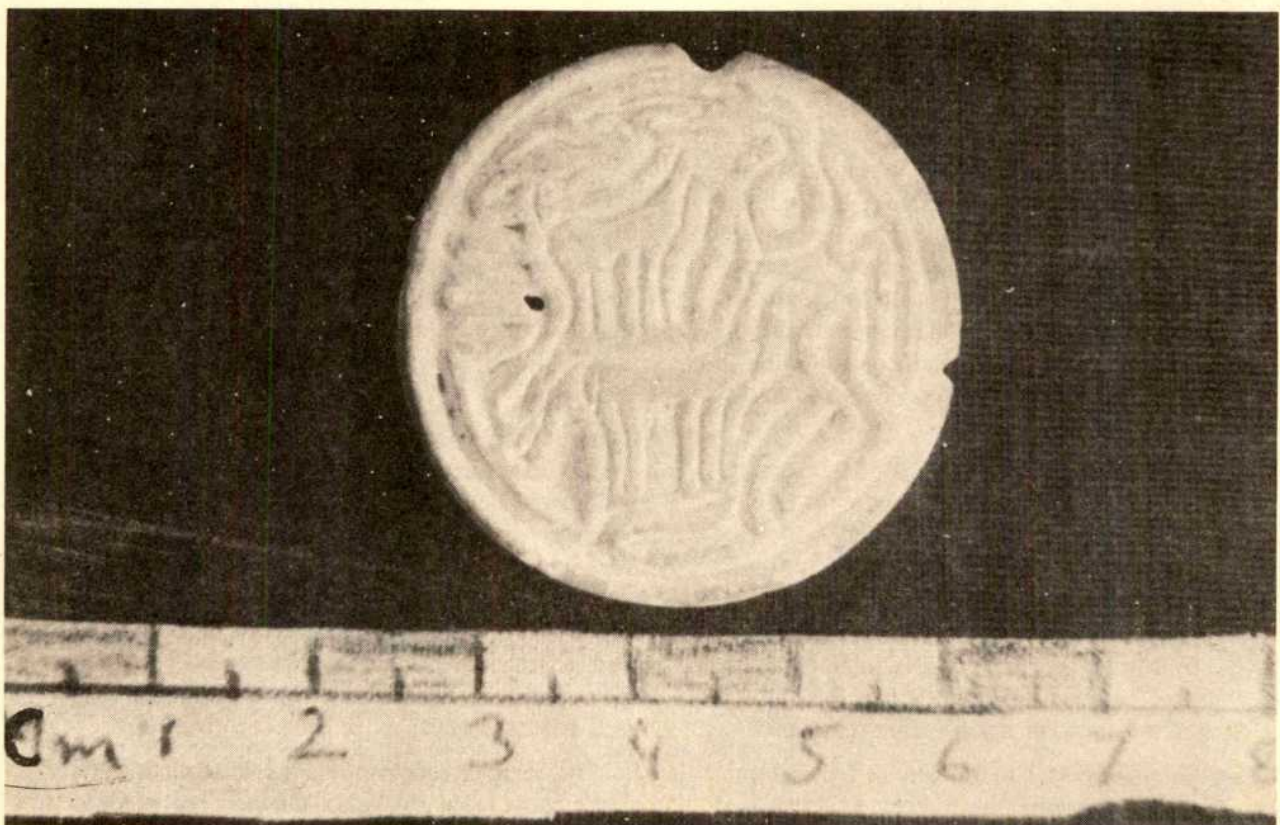


Fig. 2: Two bull-like creatures seen one above the other

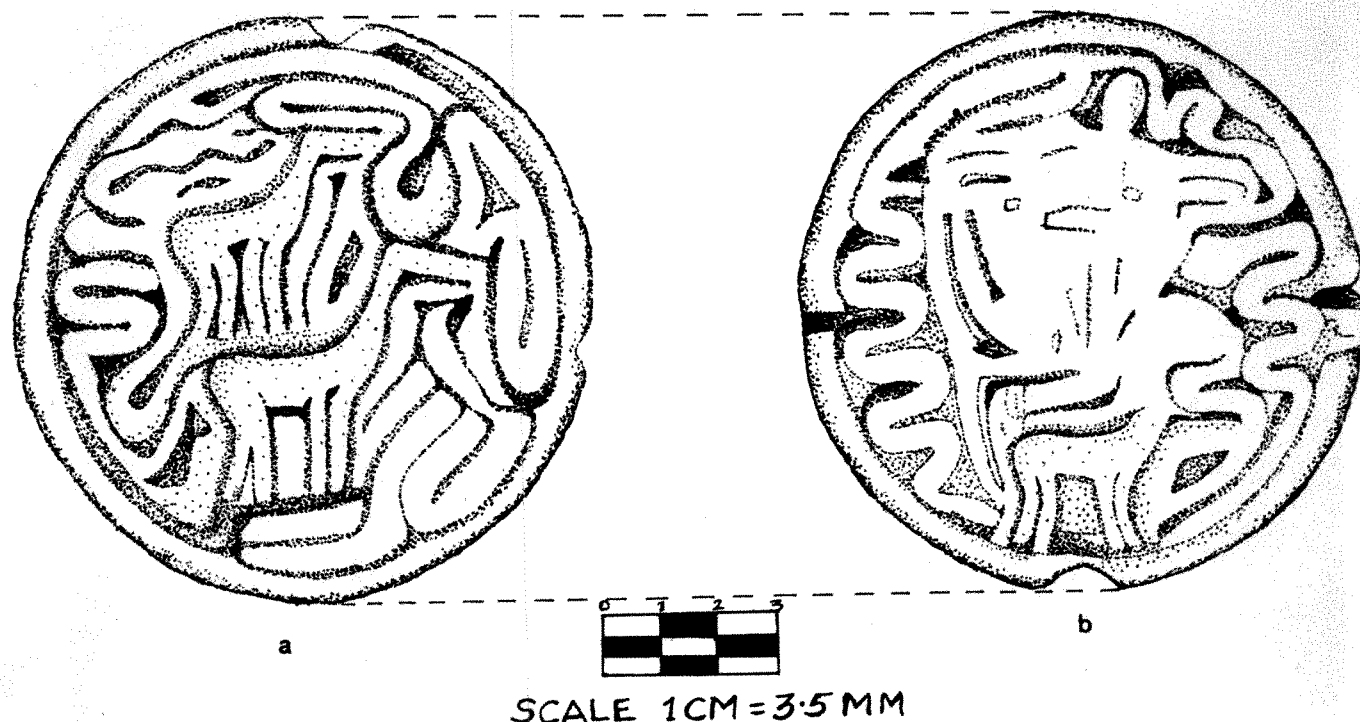


Fig. 3: Line drawings of the seal. a. Depicting two bull-like creatures and the coiled snake-like forms. b. Figure seated on chair or throne with the hood of the snake seen above his head

and that the unclear impression was produced through abrasion, because perhaps this side of the seal was being constantly rubbed against the skin of the person who was wearing it. However, it is possible to distinguish a snake coiled around the periphery of the seal, with the head of the reptile oriented towards the central portion of the seal.

Keeping the two holes of the diagonal perforation through the seal as vertices, one can see the figure of a person sitting in a regal manner, while the hood of the snake is seen above his head (Fig. 3b). Looking at the seal from an angle of 90°, one can see the animal-like form at the base (Fig. 3a).

The chair or the throne on which the person or deity is seated, resembles an Egyptian throne. In fact, its curved legs are reminiscent of the furniture found in Tutankhamen's tomb (Fig. 4).

The Egyptian affinities of the seal are tentatively suggested on the basis of the following factors :

1. Round bifacial seals from Egypt are made of faience.
2. The presence of the Apis bull, which is very much an Egyptian mascot.
3. The coiled snake with a hood is again prominently displayed on the headgear of the Egyptian Pharaohs.
4. The chair or throne depicted on the seal is similar to the Egyptian ones.

The seal was examined by Prof. Gregory Possehl of the University of Pennsylvania, who agreed that it is contemporary with the Harappan civilization, though he admitted that he had not seen a similar object from any other Harappan site.

Moreover, the Harappan seals that have been found at Mohenjo- Daro, Harappa, Lothal, and Dholavira, mostly have impressions of animals such as unicorns, bulls, etc. Seals with motifs of snakes have not been found at any Harappan site. Of course, one lozenge- shaped seal from Harappa, with an eagle and snakes on one side, and a cross on the other, is evidently not Harappan, but of foreign origin. The head of the eagle is turned to the left and its wings are spread as in the case of the bronze eagles from Susa and Tell Brak. The Tell Brak eagle is dated to 2100 B.C. (Rao 1963b: 148-149).

Some seals, believed to be Harappan, have been found at Ur and Babylon (Gadd 1932). The seals found at Ur, about seven in number, are mostly circular in shape and have a button boss on the reverse. The presence of the Harappan script on these seals and the type of motifs depicted on them indicate that they are of Harappan origin. Moreover, they are made of steatite, as is the case with most Harappan seals. However, none of these seals are similar to the one under discussion.

The Persian Gulf seal discovered from Lothal is also of steatite, and is light gray in colour with a creamy surface. It is also circular in outline, with a diameter of 2.25 cm and a

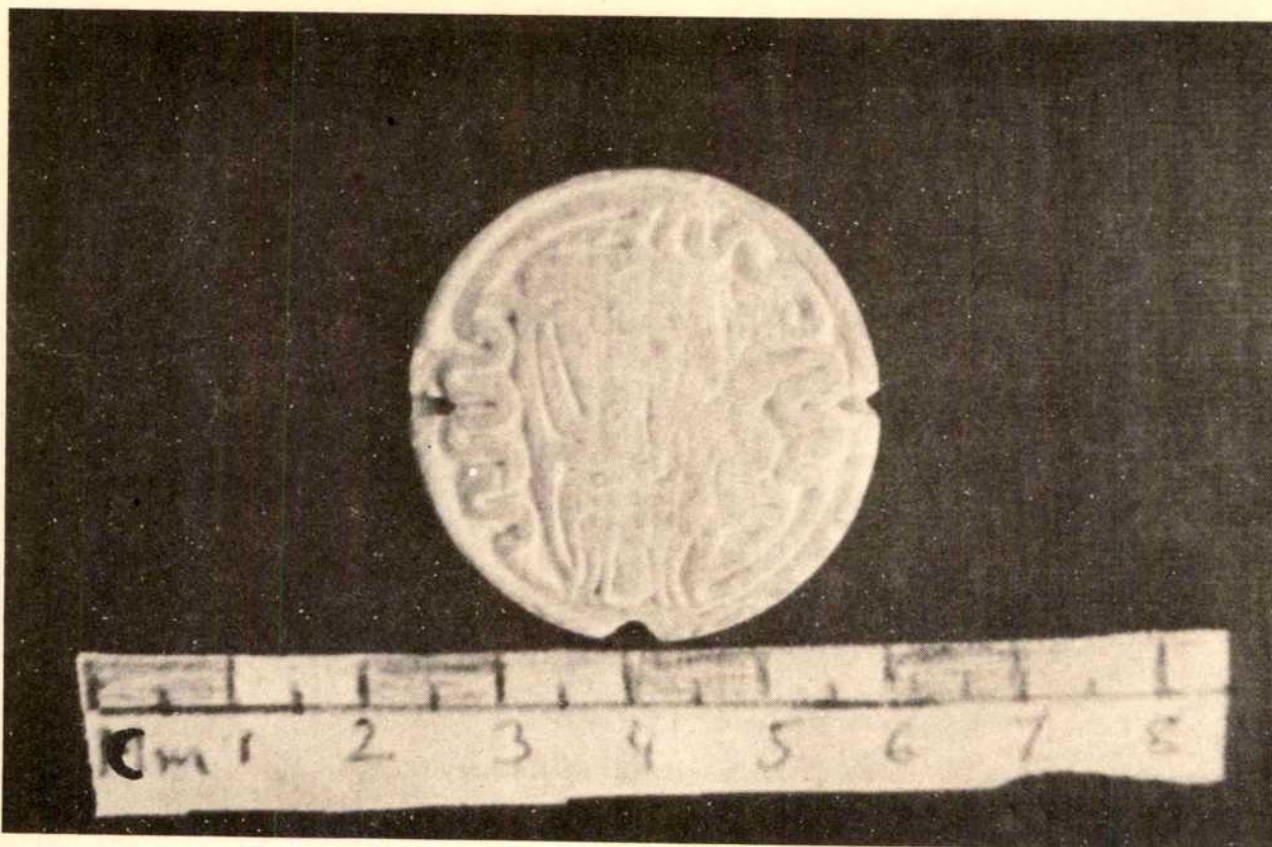


Fig. 4: Reverse of the seal showing figure on throne/chair and coiled snake-like form

thickness of 1.2 cm at the centre. "At the back is a perforated boss covering almost the entire surface and divided by triple lines between four circlets with a central dot. On the face are two jumping goats or gazelle-like animals looking behind and flaunting a double-headed dragon. Both in motif and in shape, this seal is entirely different from the normal square seals of the Indus civilization and Sumerian cylindrical seals" (Rao 1963b: 148). The Rangpur seal resembles the circular, steatite Persian Gulf seal which was found in Bahrain.

Taking the Harappan and the Persian Gulf seals into consideration, it is evident that the Rangpur seal is unique, inasmuch as it is not the usual square type of Harappan seal, nor does it bear any script.

It is also unlike the circular seals from Ur, which are believed to be Harappan. Moreover, the Rangpur seal, unlike the others, bears impressions on both sides, though it does not have any boss. In size it is larger than the seals found at Harappa and other contemporary Indus sites. The perforations are also unique, because this feature is not found in seals from Harappa, the Persian Gulf, or from Ur. So, what type of seal is it? Is it Egyptian because the horns of the Apis bull are depicted on one side, the Egyptian type throne on the other, and the snake on both the sides? If so, then did the Harappans have trading links with the ancient Egyptians. This line of inquiry is of great archaeological potential, and needs to be pursued.

In this connection, it would be interesting to note the observations of Ernest Mackay regarding the standard-like object in front of the unicorn on the Mohenjo-Daro seals: "I do not suggest that Mohenjo-Daro had anciently any considerable connection with Egypt. But in some small respects the beliefs of the two peoples were clearly similar. The fact that at Mohenjo-Daro certain animals were probably sacred, that a cult object was associated with the chief of them, and that both animal and cult object were sometimes carried, on standards of processions, are strongly reminiscent of the practice of ancient Egypt, where cult objects were always associated with the sacred or 'nome' animals carried there on standards" (Mackay 1931: 385).

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Archaeology of Kumaon: Problems and Prospects

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Abstract

Little is known of the archaeology of this area prior to the 8th century. However, work carried out in the last two decades provides evidence for Palaeolithic and Megalithic cultures, as well as for a number of painted rock shelters. This paper summarises the work done to date and draws attention to the research potential of the area.

Introduction

Kumaon — comprising the districts of Almora, Pithoragarh and Naini Tal in the Central Himalaya — is a very interesting area for archaeological research. From the 8th century onwards temples, sculptures and inscriptions are well-known and quite a bit has been written about them (Misra 1935; Nautiyal 1969). More interesting, however, is the prehistory of this region. Reports of palaeoliths, megaliths, rock paintings, etc. indicate the potential of the area, though at present large gaps remain in our knowledge. This essay presents a brief review of the data and directions for further research, especially in prehistory.

Kumaon or Kurmachal is mentioned in the Manaskhand and other early literary references. Waves of Khasas, Daradas, Saka-Kusanas and others have left their imprint on the culture of the area. The Kumaoni language has words from Indo-Aryan and even the Mon Khmer language groups. The adoption of the Saka era by the early ruling dynasties, their claim to have descended from the Saka-Salivahanas, the prevalence of Sun worship, etc. indicate Saka-Kusana influence on this region. The Sun god is depicted in a typical Kusana dress.

It may be mentioned here that Rahul Sankrityayan (1958) and other early writers have traced the Khasa people of Kumaon back to the Kassites of Mesopotamia. The people of Kashmir, Kasgar, etc. are all related to the Khasas. These were the tribes who preceded the Vedic Aryans and were looked down upon by the latter. It is also mentioned that the Assyrian King Bana Asur (668-662 B.C.) was the last powerful king and is identified with Banasura to whom a temple has been dedicated in Lohaghat and Katyura (Baneshvar). Some of these people might have been associated

with the stone graves described below. A study of inscriptions from Mesopotamia will be relevant in this context to help resolve some of these issues.

The historical period in Kumaon coincides with the beginning of the Christian era or may even begin slightly earlier. The Kuninda coins of the 1st and 2nd centuries B.C. as also Kusana coins have been reported. It appears that during the Kusana period (Fig. 1) extensive areas were settled. From Garhwal, structural remains of the 5th century B.C., a Kusana temple at Moradhwaj and a Painted Gray Ware site at Thapli have been reported. It is difficult to say at this stage when the first bronze or iron objects were used in this region.

This article focuses on the prehistoric finds under three headings: 1. Megaliths, 2. Rock Paintings and 3. Palaeoliths

Megaliths

"Megaliths" have been reported from all over Kumaon and the Garhwal region. The descriptions are generally very loose and do not help to work out either their typology or chronology (Henwood 1958; Wheeler 1959). This situation is compounded by the fact that stone has been used in a variety of old, as also not so old, burials. There are also burials of the Rohellas, who attacked and plundered the region under Ali Mohammed Khan in 1743-44. They are reported to have died in large numbers due to the intense cold in the hills and a cholera epidemic. On the Bageshwar-Kapkot Road, near the Balighat bridge, three *Nauhatia* (9 hands long = 14 ft long) graves have been reported. Unfortunately, when the authors examined the sites, it appeared that some recent campers had done a lot of digging to pitch tents and even the shapes of the burial mounds could not be

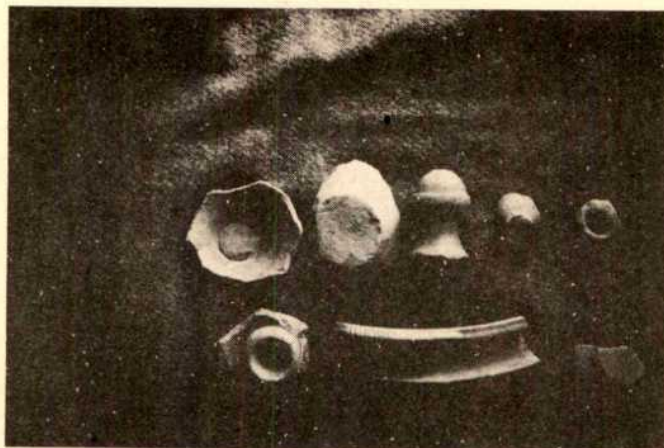


Fig. 1: Kusana pottery types from Vibhandeshwara near Dwarahat (Almora). Sri Deep Harbola's collection

identified. These graves are only 250 years old but their widespread occurrence has resulted in augmenting the number of "Megaliths" reported from the area.

Even today the Gosian and Nath communities bury their dead. However, they make a deep squarish pit and lower the body into it in a cross-legged seated position along with a metallic *lota*, coins and an earthen lamp (*diya*). These graves are marked by a small mound of earth and stones. It is more than likely that earlier workers, in their enthusiasm to find Megaliths, have probably also included such burials in their general reports.

Besides the above mentioned, there are burials belonging to the early Christians, the British and the Chinese. Many old villagers of the Baijnath-Gwaldam area claim that the British invited Chinese tea-planters to start tea plantations there and some of the graves near Dangoli (on the Baijnath-Gwaldam road) belong to the latter. The authors examined several graves in this area. They comprise rectangular structures made of rough hewn stone masonry measuring approximately 315 x 180 x 50 cm or 265 x 127 x 62.5 cm.

On one of them a broken slab read "at" in English and on another, a stone cross bore the legend "Pan Sinh" in the



Fig. 2: Early British and Christian stone graves, near Dangoli, on the Baijnath-Gwaldam road (Almora)



Fig. 3: Stone cross on an early Christian stone grave, near Dangoli, on the Baijnath-Gwaldam road (Almora)

Devanagari script (Figs. 2 and 3). The British took over the Kumaon region from the Nepalis in 1815, therefore some of these graves could be about 200 years old.

Thus we see that such graves, though using stone could not be older than 250 years and could have belonged to the Rohellas, the British or the Nath. But such remains did swell the number of the reports of the so-called Megalithic burials. We have therefore first described the graves that could not be "Megalithic" by any criteria.

After sifting the grain from the chaff, we are left with only a few burials which might have some respectable antiquity. These are of two types and both have been examined personally by some of the authors.

The first group was found at Malari by S.P. Malari (personal communication) in the fifties of this century. Malari is a border village in the Niti Valley situated at an altitude of 3800 m AMSL and about 60 km from Joshimath on the banks of the Dhaul Ganga. One of the authors visited the site in 1959 when there were few motorable roads. The six week exploration started from Baijnath and proceeded to Malari via Gwaldam. Besides using the Karnaprayag-Pipalkoti motorable road, a few kilometers had to be covered on foot. In fact, Malari was so remote from civilization that when our expedition consisting of one of the authors (DPA) and some porters reached this village, everyone rapidly closed their doors and windows. Only after taking the village chief into confidence were we able to enlist their cooperation. Unfortunately the graves had been destroyed and all we could collect were some intact and some broken pots from the destroyed sites. The pots were of Red Ware with handles and spouts and in one case we discovered a *lota* with a channeled mouth. The villagers informed us that the graves had been stone lined and contained complete inhumations, and some also had secondary burials. A few bronze tripods and some horse harnessing equipment were also reported. Horse burials had been discovered. Though it was necessary to depend upon the villagers' accounts, the accuracy of these reports were corroborated by several villagers as also by Dabral's report (1968) and found to be fairly reliable. An



Figs. 4-5: Views of the section of a terrace on the Ganai-Jaurasi road, near Kurman village (Almora) with stone burials

intensive exploration, will probably lead to fruitful discoveries.

These graves can probably be associated with the early tribes of Khasas, Daradas, etc. that entered this region.

Those graves that can, however, legitimately lay claim to being "stone graves" if not "Megaliths" are the ones reported from the west Ramganga valley.

Villagers from the sites of Jainal and Naula on the Ranikhet- Bhikiasen road (near Masi), describe stone-lined graves and we saw a stone supposedly obtained from one such grave. Mathpal (1986) describes the size of one of these graves as being 7' x 2.5' x 3' and states that it was paved with stone slabs and contained two pots (one had a mouth of 1' diameter). Though Mathpal claims that he has seen the graves himself, the villagers say that they gave him the pots collected from the burials. His illustration is also not very revealing as it is more like an artist's impression. Mathpal also claims that these graves are oriented on an E-W axis, but the authors did not encounter any remains and despite extensive exploration cannot comment on the Naula graves.

Not far from Naula, however, in Ganai area, on the Ganai-Jaurasi road, similar burials were discovered. These were exposed in a section of the alluvial terrace (Fig. 4 and 5 of the Kaurvi stream, near Kurman village and were



Fig. 6: A stone burial near Kurman village (Almora): a closeup of side view

noticed while examining the Quaternary terraces (Dr. L.S. Manral of Ganai helped locate the site). Of the three burials discovered, only one was exposed fully on its longer axis and the maximum length was 127 cm. In all three examples the height was around 42 cm, but the width varied from 25 to 51 cm. If we compare the Ganai stone burial with that of Naula as reported by Mathpal, there is a significant difference but whether this is because of imprecise measurements cannot be decided till an actual Naula grave can be examined.

The actual and apparent differences between the Naula and Ganai graves are as follows.

Table 1: Comparison of the Ganai and Naula Graves

Grave Size	Ganai	Naula
Length	127 cm	2.2 m
Width	25-51 cm	75 cm
Height	42 cm	90 cm
Orientation	NNE-SSW	E-W
Burial pot	—	—
Diameter	9.2 cm	30 cm

One of the graves had no front wall and was cleaned without disturbing or exposing the burials (Fig. 6). A small fragmented Red Ware pot was discovered here. It is of the *handi* type, was fired at low temperature, is of thin fabric and rather fragile (Fig. 7). Morphologically it has analogues in the Hastinapur III Red Ware assemblage. Its soil contents have been sent for TL dating to the Physical Research Laboratory, Ahmedabad. No bones were seen, though the villagers claim to have seen limb bones sticking out from similar burials in this section. This example appears to be a secondary burial and not an inhumation. The rectangular grave pit is lined with thin stone-slabs. None of these burials are typologically similar to Megaliths. Small dressed stones used for lining the graves cannot be described as Megaliths, but these are the only graves that come closest to the description of "Megaliths"!

No datable material was found in the graves. The fine pot and dressed thin stones do not suggest a very high

antiquity. Dating these burials accurately will require further controlled excavations. Only then can they be compared with the excavated graves of the Gandhara Grave Culture (Swat Valley, Pakistan). At the moment the nearest parallel can be seen at the Kheri graveyard, located at the confluence of the Ghorbund and Indus rivers in Pakistan. Here the cist burials are also rectangular, lined with stone slabs and with a slab for the floor as well. Two to three flat stones cover the grave. Stacul (1987) says that where the land is gravelly the pits are lined with stones to withstand erosion, otherwise simple pits have also been used. The Kherai burial also appears to be a secondary one with a single pot placed at either end of the grave. This was also the practice for the Naula graves. Stacul (1987) emphasizes the fact that the graves are not aligned in any specific direction but have their main axis transverse to the hillside. It may be noted, however, that both fractional and complete burials were in vogue both in the Swat Valley and Kherai. The Kherai graves belong to Period IV dated to c. 1400-1000 B.C.. It would not be correct to assign a similar antiquity to the Ganai graves without some datable evidence from the graves themselves. The South Indian graves are quite massive by comparison though rectangular cists with stone sides are also known from Karnataka (Sundara 1975).

In the Ganai region the graves are clustered together, suggestive of a graveyard. The graves have been dug into the alluvial terrace to a depth of 1-2 m below the surface. The section shows only gravel and sand and no habitation debris. It can therefore be inferred that the dead were interred away from the habitation, not as complete inhumations but only as secondary burials. Both at Ganai and Naula-Jainal the graves are located on the alluvial terraces, as stated by Stacul (1987) for the Kherai graves.

In this region there are probably only two ancient burials: 1. the Malari type and 2. the Ganai type. What is their distinction, their age and ethnic associations are questions to be specifically tackled during future extensive explorations.

It may, however, be mentioned here that Nautiyal and Khanduri (1986) have reported a stone circle Megalith, of about 15 m diameter, from Dangoli, on the Baijnath-Gwaldam road. They have illustrated the circle with a line

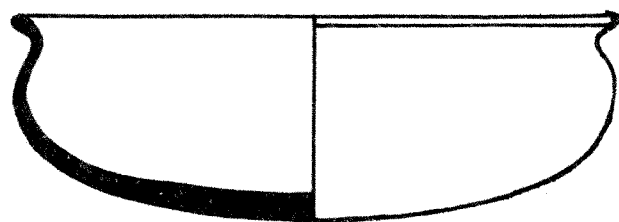


Fig. 7: Drawing of the Red Ware handi. The mouth of the pot has a diameter of 9.2 cm.

drawing but no photograph is given. Extensive explorations in the area by the present authors did not lead to the discovery of any such Megalithic circles. There are some round *chabutras* but no stone circles.

Rock Shelters

A number of sites with painted rock shelters have now been reported from this region (Agrawal and Joshi 1978; Mathpal 1986; Nautiyal and Khanduri 1986), but so far no systematic study has been attempted of the various painting styles, nor are there any dates available. At Lakhu Udyar, one of the authors noticed some rock shelters with some habitation debris. A systematic study of these rock painting styles, as also exploration of some habitation rock shelters and comparison with other rock painting groups of India is necessary.

The motifs in the rock paintings include both human and animal figures, and depict birds, lizards, jackals, dancing human figures, etc. done in red and black pigment. The absence of metal objects in the paintings indicates their Stone Age antiquity, though no firm dating is possible at this stage. One of the authors found a few microliths from Lakhu Udyar, but without any contextual evidence, it is not possible to vouch for a local microlithic assemblage. It is proposed to explore the area further and establish the antiquity of these rock paintings, especially to verify if their antiquity goes back to the Upper Palaeolithic. So far there is no such evidence forthcoming from this region not even of the Mesolithic or the Neolithic.

Palaeolithic

Palaeoliths have been reported from the Alakananda valley (Garhwal) and also from the Ramganga valley (Prasad and Rawat 1978; Nautiyal and Khanduri 1986; Mathpal 1986). The authors have not examined these collections but unifacial and bifacial choppers are considered reliable finds only from factory sites and when accompanied by debitage. In fact we did find some quartzite choppers from a terrace surface of the Ramganga valley. However, their authenticity cannot be ascertained in the absence of any primary sites in the vicinity. Further explorations may yield new evidence.

Quaternary studies in this region have thus far been limited to the relict lake sediments both from Bhim Tal and Pithoragarh. The latter is a miniature representation of the Karewas of Kashmir and betrays its potential for a multidisciplinary programme for the reconstruction of the palaeoclimate and palaeoenvironment. Holocene climatic reconstructions for the Bhim Tal have been carried out (Agrawal *et al.* 1986; Sharma *et al.* 1988; Kusumgar *et al.* 1989). It is observed that at about 4500 B.P. there was a sharp decline in the forest cover accompanied by an increase in soil erosion (Agrawal *et al.* 1986; Dodia 1988). It may be possible that this observed phenomenon can be attributed to Neolithic human activity in this area.

The glacial moraines as seen in the Chokoi area situated at about 2000 m AMSL appear potentially suitable for the reconstruction of glacial advances and retreats.

Conclusions

Thus Kumaon even with the minimum evidence available presents an exciting prehistoric panorama and indicates the rich archaeological potential of this region. A study of the variety of Stone Age assemblages and human remains; a comparative study of prehistoric rock paintings and shelters; a pan-Himalayan study of early stone burials and their comparison with the Gandhara burials and others reported from Ladakh and Himachal; work on the bronze and iron metallurgy in this region, etc. are problems which need to be addressed not only to document Kumaon prehistory but also to further our understanding of the prehistory of northern India.

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Palaeovegetation and Palaeoenvironmental Inferences from the Quaternary Palynostratigraphy of the Western Indian Plains

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Abstract

This paper reviews the pollen analytical work carried out in Rajasthan and Gujarat. Studies on desert lakes situated in Rajasthan show that before 10,000 years B.P., extremely arid conditions with strong winds prevailed in the region, resulting in the deposition of sand dunes and the formation of inland basins. Stabilisation of sand dunes and the advent of herbaceous vegetation coupled with freshwater conditions in the lakes is evident between 10,000- 9,000 years B.P. Except for the increased annual precipitation, the climatic and vegetational conditions remained the same between 9,500 and 5,000 years B.P. The lakes started turning saline and arboreal elements entered the area between 5,000 and 3,000 years B.P. The present-day conditions began by 1,200 years B.P. In Gujarat, the early Holocene vegetation continued with herbaceous elements. The invasion of an arboreal element, around 7,000 years B.P., declined around 5,000-4,000 years B.P. Thereafter, savannah conditions prevailed.

Introduction

In India, research on Quaternary palynology began in the early part of this century, when Huntington (1906) undertook pollen analysis of sediments from Pangong Lake (Ladakh), which is situated at an altitude of about 4250 m AMSL. Based on the pollen grains of a number of herbaceous taxa recovered from the lake profile, he tentatively dated these sedimentary deposits to the Interglacial period.

It was after a lapse of nearly three decades that Wodehouse (1935) resumed work on the Karewa sediments covering both the lower as well as the upper Karewa. He also analyzed pollen from Wular and Manasbal lakes, both of which are situated in Kashmir. Subsequently, Deevey (1937) described pollen spectra belonging to the second Interglacial period from sediments that were obtained from Pangong Lake. The analysis of pollen from the Himalayan region resumed in the mid-fifties at the Birbal Sahni Institute of Palaeobotany (BSIP), Lucknow (Nair 1960, 1968) and since then these studies have continued at the BSIP and elsewhere. This paper contains results of the research carried out in Kashmir, Ladakh, Himachal Pradesh, Kumaon, Garhwal, Rajasthan, Gujarat, Maharashtra, Pratapgarh, the Nilgiris, the Bengal Basin, Assam, Meghalaya, and the adjoining Himalayan Kingdom of Nepal.

Rajasthan

Results of the analysis of pollen from sediments in northern Rajasthan were published by Singh *et al.* (1972). Further work was carried out by Singh *et al.* (1974) in the same area which also included the Pushkar Lake in central Rajasthan (Fig. 1).

Recently, Saxena (1984) has investigated a few more profiles, namely those of Kanodwala Rann and Pokaran Rann in the southwest and Budha-Pushkar, in addition to re-examining the two profiles from Didwana and Pushkar.

1. *Sambhar Salt Lake*: The salt lake at Sambhar (27° N, 75° E), District Jaipur, is the most important and extensive saline lake in Rajasthan. The lake is about 35 km long, with a width varying from 3 to 11 km. During the rainy season the lake is filled with water which is 1 m deep, but it dries up completely during the summer months.

2. *Didwana Salt Lake*: The salt lake at Didwana (27° 20' N, 74° 35' E), District Nagaur, is situated about 64 km northwest of the Sambhar salt lake. The lake basin, which lies in a valley, is about 5.6 and 2.4 km in length and breadth, respectively. Some water collects in the lake basin during the rainy season, but it evaporates during the dry months, leaving a crust of salt over a small area in the centre.

3. *Lunkaransar Salt Lake*: The salt lake at Lunkaransar

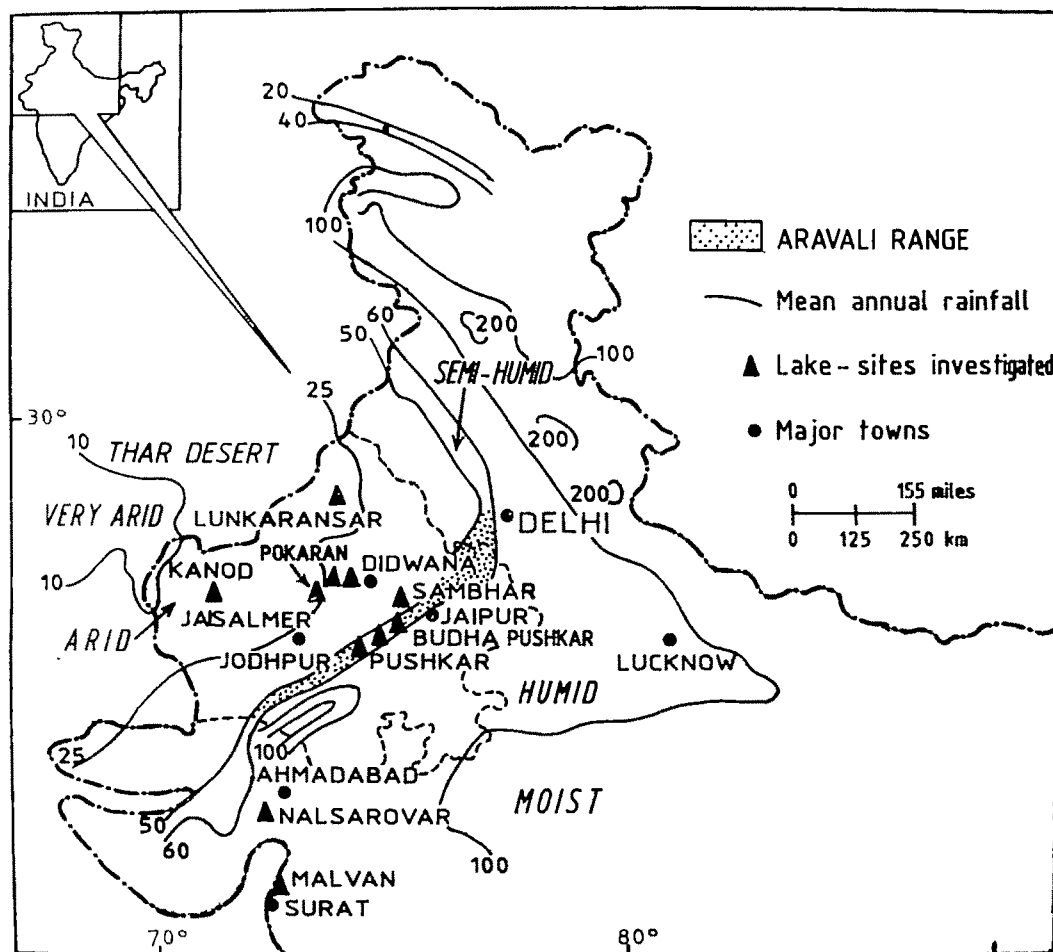


Fig. 1: North-Western India: Annual rainfall and broad climatic divisions

(28° 30'N, 73° 45'E), District Bikaner, is one of the few large inland basins in the arid belt, and is located near the Thar desert. It is more or less elliptical in outline and covers an area of about 5 sq km. The lake basin is filled with water only during the rainy season.

4. *Kanodwala Rann*: This saline depression is situated about 50 km northeast of Jaisalmer town. It is about 5 km in width, forming a crescent-shaped depression. It remains dry for the greater part of the year and is filled with water only if the area gets adequate rainfall.

5. *Pokaran Rann*: This saline depression is 6.25 km long and 2.5 km wide and is one of the five depressions named after a local village in the Pokaran region. Pokaran Rann is situated very close to Pokaran city and is approachable by the Pokaran-Jodhpur highway.

6. *Pushkar Lake*: This freshwater lake is situated about 11 km west of Ajmer, in central Rajasthan. This lake is approximately 4 km away from Budha-Pushkar and is one of the most important pilgrimage centres of the Hindus (Sarda 1941). The lake extends southeastwards during the rainy season but shrinks to a small oval pond in the dry months when it is fed by subterranean springs.

7. *Budha-Pushkar Lake*: This is a freshwater lake situated about 7 km west of Ajmer, in the Aravalli Range within the eastern part of the Rajasthan desert. The lake is surrounded by stabilized sand dunes and is located at the foot of a great linear dune which blocks the valley at this point. Most of the rainfall is absorbed by the surrounding sand dunes and only a little water reaches the lake in the form of surface run-off. Thus the subterranean springs here constitute the main source of water.

Gujarat (Fig. 1)

Two lake sites in Gujarat namely, Nalsarovar and Malvan (Vishnu-Mittre and Sharma 1975, 1979) have been surveyed so far.

1. *Nalsarovar*. This lake (22° 45'N, 72° 6'E) is a brackish shallow water lake which is situated about 60 km southwest of Ahmedabad. It is 30 km long and 6 km wide, extending over an area of about 80 sq km. The lake is an important sanctuary for migratory birds and lies in the low alluvial tract separating Ahmedabad from Saurashtra, and connects the southeastern extremity of the Rann of Kachch with the head of the Gulf of Cambay. The present region of Kachch is believed to have been a part of the sea until recent times,

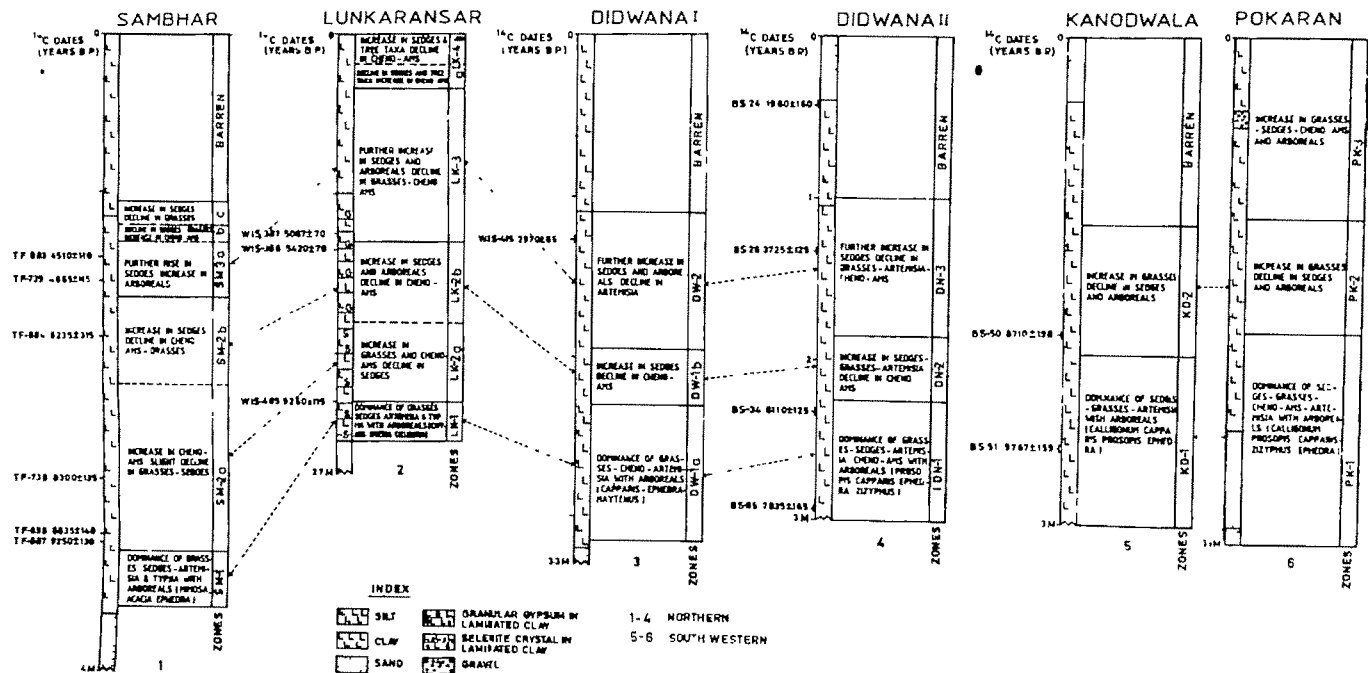


Fig. 2: Northern and South-Western Rajasthan: Comparative study of the investigated pollen profiles

and estuarine conditions may have prevailed in the area surrounding the Nal Lake.

2. *Malvan*: A salt flat, dissected by meandering channels at Malvan (27° 7'N, 72° 42'E) is situated on the lower estuary of the river Tapi, east of Dumas, in District Surat. Formerly it was an oxbow lake, more or less kidney-shaped, and covering an area of more than 1 sq km.

Modern Pollen Rain Studies

Singh *et al.* (1973) have carried out a detailed study of modern pollen rain in the different climatic belts of north-west India. Their studies have shown that in the adjacent region the pollen of herbs dominates over that of trees and shrubs, whereas in the arid belt, the pollen of shrubby elements is more common. However, in the areas with a higher precipitation, the tree elements attain maximum frequencies. Cerealia type pollen usually occurs in areas where cereals are cultivated. *Acacia*, *Prosopis*, *Zizyphus*, *Salvadora*, *Maytenus* and species of Leguminosae, Labiatae and Geraniaceae are poorly represented.

However, the studies carried out by Saxena (1984) on different plant communities within and outside the forests distributed in central and southwest Rajasthan reveal, in general, the dominance of non-arbores over arbores, with a preponderance of grasses and sedges. The spectra from the halophytic scrub community show high frequencies of grasses, sedges and chenopods, whereas *Capparis*, *Calligonum*, *Prosopis*, *Salvadora*, etc., are reflected by low values. The pollen spectra from the *Acacia-Capparis* com-

munity, however, contain a preponderance of sedges among the constituents of ground vegetation. The desert elements, such as *Acacia*, *Prosopis*, *Zizyphus*, *Ephedra*, are characterized by their high values, whereas *Capparis* is under-represented.

Environmental Inferences from the Investigated Profiles

Rajasthan

Pollen analyses carried out in Rajasthan by Singh *et al.* (1972, 1974) have unravelled the history of vegetation and climate dating from the early Holocene. In order to define the Holocene vegetation and to interpret local environmental conditions they have considered the pollen diagrams collectively and grouped them into five phases, four of which (II-V) were based on biostratigraphic evidence, whereas Phase I is recognized on the basis of lithostratigraphic criteria.

The deposits show three distinct facies, namely, pre-lacustrine, lacustrine and post-lacustrine. The pre-lacustrine phase is mainly comprised of aeolian sands. At lower levels, the sand grades into a calcrete pan which may have resulted from leaching as well as the cementing of sand particles by calcium carbonate.

Since the detailed accounts of all the investigated profiles have already been published by Singh *et al.* (1972, 1974), we shall present here only a brief resume of the results of work on three lake sites, namely, Lunkaransar, Sambhar and Didwana, all of which are situated in the

northern part of the Rajasthan desert.

(a) *Lunkaransar-Sambhar-Didwana Pollen Diagrams*

Phase I (Pre 10,000 yr B.P.): This may be of pre-Holocene age and consists of aeolian sand which is found at all the three lake sites. The lithological studies suggest that strong winds may have prevailed in western Rajasthan, leading to the extensive deposition of sand dunes which choked the valleys with wind blown sand. This process resulted in the formation of inland basins such as those of Sambhar, Lunkaransar and Didwana.

Phase II (10,000-9,500 yr B.P.): Cyperaceae — Gramineae — Artemisiae Assemblage Zone: This zone is characterized by an open grassland steppe in which sedges were dominant, but which was poor in halophytes. *Artemisia*, a plant associated with higher rainfall, was quite well represented during this phase. Taking this assemblage into consideration, as well as the absence of sand layers in the lake sediments during this phase, it has been concluded that the sand dunes had begun to stabilize (Singh 1971) and that fresh water conditions prevailed in the lake basin. This has also been corroborated by the presence of *Typha angustata*, a freshwater swamp species.

Phase III (9,500-5,000 yr B.P.): Gramineae-Artemisia-Chenopodium/Amaranthus Assemblage Zone: Except for localized fluctuations, this phase is characterized by vegetation which is more or less similar to the preceding phase. The continued growth of *Typha angustata*, *Artemisia* and *Oldenlandia* is, however, suggestive of relatively high precipitation.

Phase IV (5,000-3,000 yr B.P.): Cyperaceae and Tree/Shrub Assemblage Zone: The phase starts with a sudden increase in the frequencies of sedges and a rise in tree and shrub vegetation. *Prosopis cineraria*, *Acacia* sp., *Capparis* sp. and *Mimosa rubicaulis* are recorded in the semi-arid belt (Sambhar and Didwana salt lakes), *Calligonum polygonoides* in the arid belt (Lunkaransar Salt-lake), whereas *Syzygium cumini* and the sedges attained their maximum levels of growth in both the semi-arid and arid belts. *Typha angustata* too occurred in both the semi-arid as well as arid belts, as was seen in the earlier phase. Singh *et al.* (1974) inferred that in the arid belt, the average annual rainfall was probably 50 cm higher than at present. It was during this phase that the lakes started turning saline.

Phase V (early centuries A.D. to the present): Gramineae — Chenopodium/Amaranthus — Cyperaceae — Calligonum Assemblage Zone: This phase is known to be represented only at Lunkaransar, and is separated from the earlier phase by a pollen-free interval which is more or less similar to the present climatic conditions of the area.

(b) *Pollen Sequences from Pokaran and Kanodwala Ranns*
The pattern of vegetational development, as reconstructed

from the pollen diagrams of the Ranns of Kanodwala and Pokaran, reveals that this region had been dominated by vegetation in which sedges had predominated between 10,000 and 8700 yr B.P.. Open forested conditions or stands represented by the *Calligonum polygonoides* community and the *Prosopis* — *Capparis*-*Ephedra*-*Zizyphus* community had occurred in the immediate vicinity of the lakes.

By about 8700 years ago, grasses predominated over sedges, indicating the opening out of the forest. Although this is a very significant change, it has not been possible to determine the climatic and/or environmental factors that caused it. Recently obtained pollen spectra have also failed to provide a plausible explanation for this change.

A more or less similar type of vegetation is present towards the top of the pollen diagrams, except for a slight increase in *Prosopis*, *Capparis*, and *Ephedra* along with the appearance of *Salvadora* for the first time in this phase.

However, studies carried out by Swain *et al.* (1983) to estimate the Holocene precipitation of Rajasthan, with the help of a pollen climate calibration function, seem to agree with the views of Singh *et al.* (1974) that between 10,500-3500 yr B.P. precipitation in the Rajasthan desert was 200 mm per year, which is more than the present day value.

(c) *Pushkar and Budha-Pushkar Pollen Diagrams*

The pollen sequence from Pushkar Lake (Singh *et al.* 1974) represents a continuous record of vegetational change extending almost to the present day and is divisible into three pollen zones.

Pollen Zone I is characterized by high values of *Anogeissus pendula* — a mesophytic element, whereas *Calligonum*, *Maytenus*, *Ephedra*, *Capparis*, *Zizyphus*, *Prosopis* and *Salvadora* are either poorly represented or are absent. Grasses, sedges and Euphorbia are encountered in high values, while *Artemisia* shows low values.

Pollen Zone II shows an increase in desert elements such as *Calligonum*, *Capparis*, *Maytenus*, *Ephedra* and *Prosopis*, with a simultaneous decrease in *Anogeissus pendula* which remains low throughout this zone. These changes are indicative of a vegetational shift from mesophytic to xerophytic conditions.

Pollen Zone III is characterized by a reversal of the original mesophytic character as evidenced by a rise in the occurrence of *Anogeissus*. The desert species, however, remain more or less static.

The pollen diagrams constructed recently from Budha-Pushkar and Pushkar II which are dated to about 1000 yr B.P., reflect the earlier sequence reported for Pushkar. By the extrapolation of dates, the earlier undated Pushkar pollen diagram can now be pushed back to about 3000 years B.P.

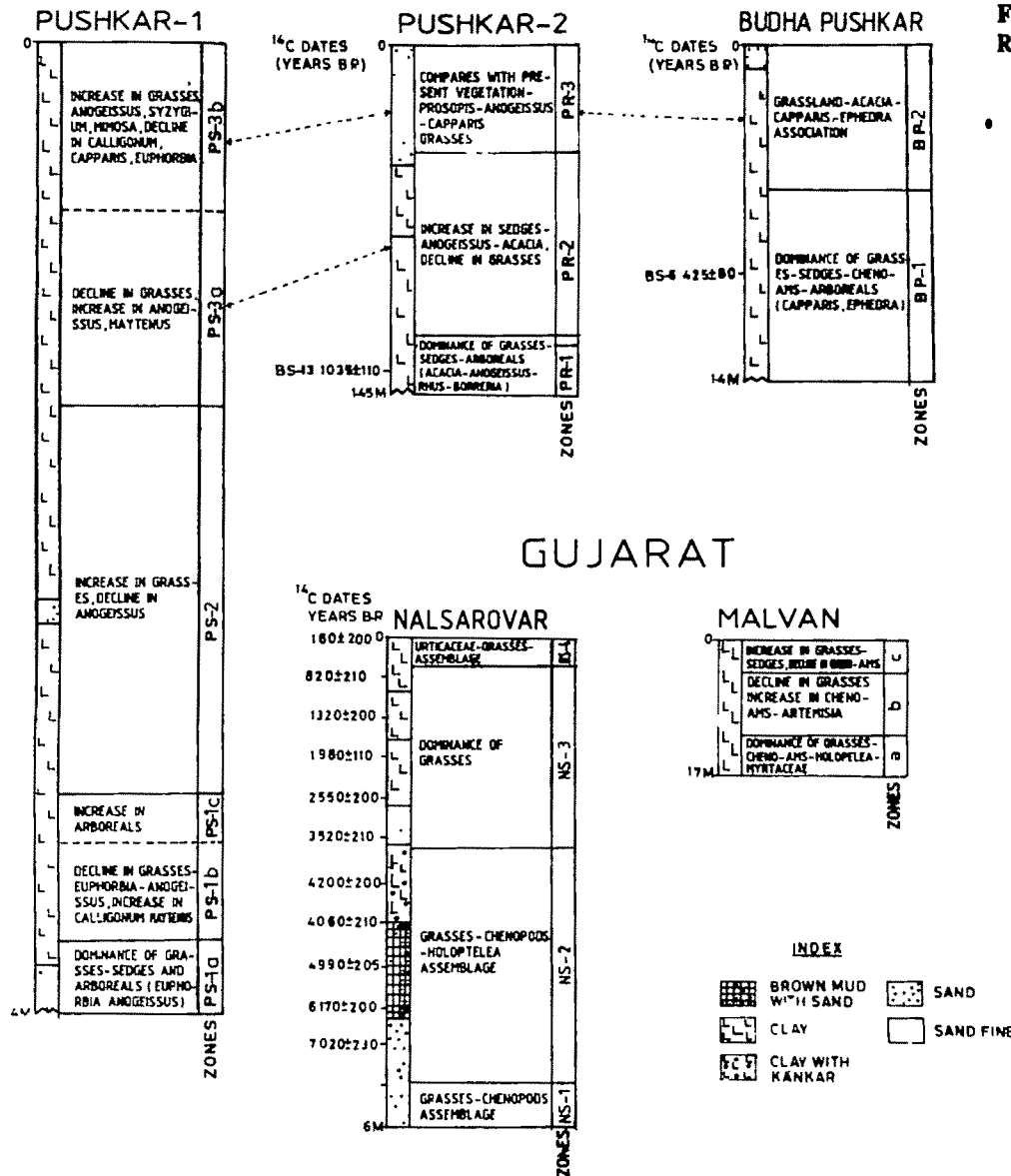


Fig. 3: Pollen diagrams for Central Rajasthan and Gujarat

Gujarat

The history of early Holocene (prior to 7000 B.P.) vegetation in this area begins with open, almost treeless stretches of grasslands with chenopods. *Holoptelea*, one of the seral elements, invaded the grasslands about 7000 years ago and constituted the riverine forest which declined about 5000 years ago. Thereafter, the overall predominance of savannah has continued (Vishnu-Mittre and Sharma 1979: 79).

Nalsarovar, situated southwest of Ahmedabad, has witnessed a number of marine inundations. The first one can

be dated prior to 7000 yr B.P., the second between 3500-7000 yr B.P., and the third around 160 yr B.P., Malvan, situated in southern Gujarat, has witnessed more or less continuous marine inundations, as reflected by the large number of microforms (both rotaloid and rectilinear) that have been recovered from the sediments.

Comparative Study of the Investigated Profiles (Figs. 2 and 3)

(a) Northern Rajasthan (Sambhar, Lunkaransar and Didwana)

Phases	Dates	Zones	Assemblages
I	Before 10,000 yr B.P.	based on lithostratigraphy	
II	10,000-9,500. yr B.P.	SM-1, LK-1, Dw-1a, DN-1	Cyperaceae-Gramineae Artemisia-Chenopodium/Amaranthus
III	9,500-5000 yr B.P.	SM-2a	Gramineae-Artemisia-Chenopodium/Amaranthus
IV	5000-3000 yr B.P.	SM-2b & SM-3, LK-2b & LK-3, DW-1b, DN-3	Cyperaceae & Tree/Shrub
V	Early centuries A.D. to the present	LK-4	Gramineae-Chenopodium/Amaranthus- Cyperaceae-Calligonum

(b) Southwestern Rajasthan (Kanodwala Rann and Pokaran Rann)

I	10,000 8, 700 yr B.P.	KD-1, PK-1	Sedges, grasses, Chenopodium/Amaranthus, Artemisia with arboreals, Calligonum, Prosopis, Capparis, Zizyphus and Ephedra
II	8,700 yr, B.P.	KD-2, PK-2	Increase in grasses, decline in sedges and arboreals

(c) Central Rajasthan (Pushkar and Budha-Pushkar)

Zones	Dates	Assemblages
PS-1	—	Dominance of grasses, sedges and arboreals, Euphorbia, Anogeissus.
PS-2	—	Increase in grasses and decline in Anogeissus.
PS-3	1000 yr B.P.	Increase in grasses, Anogeissus, Syzygium, Mimosa, decline in Calligonum, Capparis, Euphorbia.

Gujarat (Nalsarovar and Nakvab)

Zones	Dates	Assemblages
NS-1	Before 7000 yr B.P.	Grasses, Chenopods.
NS-2	7000-3500 yr B.P.	Grasses, Chenopodium/Amaranthus, Holoptelea.
MS-3	3500-160 yr B.P.	Dominance of grasses.

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¹⁴C Dates of investigated profiles

Depth in cm	¹⁴ C yr B.P.	Lab. No.
Rajasthan		
<i>Sambhar Salt-lake:</i>		
1.35-1.50	4510± 110	TF 883
1.50-1.60	4665± 110	TF 739
1.85-1.95	6235± 315	TF 884
2.74-2.85	8300± 135	TF 738
3.12-3.20	8835± 140	TF 698
3.15-3.25	9250± 130	TF 887
<i>Lunkaransar Salt-lake:</i>		
120	5060± 70	WIS 387
140	5420± 70	WIS 386
230	9260± 115	WIS 405
<i>Didwana Salt-lake I:</i>		
120-125	2970± 65	WIS 415
<i>Didwana Salt-lake II:</i>		
040-045	1960± 160	BS 24
130-135	3725± 125	BS 26
230-235	6110± 125	BS 34
290-295	7635± 165	BS 35
<i>Kanodwala Rann:</i>		
180	8701± 198	BS 50
250	9567± 159	BS 51
<i>Pushkar Lake:</i>		
1.35	1035± 110	BS 13
<i>Budha-Pushkar Lake:</i>		
1.10	425± 80	BS 6
Gujarat		
<i>Nalsarovar:</i>		
0	160± 200	TF 54
50	820± 210	TF 55
100	1320± 200	TF 56
150	1890± 110	TF 57
200	2550± 200	TF 58
250	3520± 210	TF 59
300	4280± 200	TF 60
350	4060± 210	TF 61
400	4990± 205	TF 62
450	6170± 200	TF 63
500	7020± 230	TF 64

Archaeobotanical Investigations at Oriyo Timbo (1989-1990): A Post-Urban Site in Gujarat

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Abstract

This paper emphasises the importance of intensive sampling and the use of an efficient plant recovery system to help provide a richer understanding of past subsistence economies and reports on the initial investigations of ancient plant remains at the post-urban site of Oriyo Timbo, Bhavnagar District, Gujarat. There is strong evidence for the use of summer crops. This includes *Eleusine*, *Panicum*, *Setaria*, a variety of legumes and weeds. Whether these crops were cultivated at the site or brought to the site from elsewhere, is still an unresolved question.

Introduction

The study of plant remains from archaeological sites provides information for the interpretation of a range of questions regarding changing patterns and continuing trends in the environment, subsistence patterns and economies of the past. This paper reports on the initial investigations of a representative sample of ancient plant remains recovered during the second season of excavations in 1989-90 at the post-urban site of Oriyo Timbo (21° 54' N and 71° 32' E), situated near Chiroda village, Bhavnagar District, Gujarat.

Achieving strong contextual information through intensive sampling is a necessary goal of palaeoethnobotany in order to facilitate a thorough understanding of the variability in activities related to food procurement, processing, consumption and disposal. The objectives of the archaeobotanical recovery and analysis at Oriyo Timbo are essentially twofold: to gain an understanding of the nature of the subsistence economy at the site, and to elucidate spatial and temporal variation in the plant materials at the site.

During the last season (1989-90), plant remains were recovered in the form of carbonized and uncarbonized seeds. To summarize the Oriyo Timbo 1989-90 archaeobotanical results it is appropriate to say that given the analysis done to date, there is strong evidence for the use of summer crops. This includes summer crop plants such as *Eleusine*, *Panicum*, *Setaria*, a variety of legumes and weeds. The plant remains occur in varying frequencies in all the trenches, but high concentrations occur in only 3 of the 6 trenches. Stratigraphically there is patterned variation in the frequen-

cies of carbonized seeds recovered. Strata 6 and 5 have higher frequencies of seeds as compared to stratum 4, and seeds are almost absent in stratum 7. Whether these crops were cultivated at the site by the occupants or brought to the site from elsewhere, is still an unresolved question.

As compared to the archaeobotanical finds from the first season of excavations at Oriyo Timbo (Wagner 1983b), the 1989-90 season differs primarily in overall recovery rates. The higher rate of recovery during this season is due to the larger quantity of sediment processed through flotation, and the use of a more efficient plant recovery system.

This paper emphasizes the importance of intensive sampling and the use of an efficient plant recovery system to help provide a better understanding of past subsistence economies.

Project Background

Oriyo Timbo was first excavated in 1981-82 by the Gujarat State Department of Archaeology and the University of Pennsylvania (Rissman and Chitalwala 1990). The second season of field research at the site took place in 1989-90, and was also undertaken by the Gujarat State Department of Archaeology and the University Museum of the University of Pennsylvania.

The 1989-90 field season at Oriyo Timbo entailed the excavation of six 5 x 5 m grid units immediately south of the Western Operation area of the 1981-82 excavations (see Rissman and Chitalwala 1990: Fig. 1). Twelve stratigraphic

Table 1: Archaeobotanical data:Trenches

ORIYO TIMBO 1989-1990 ARCHAEOBOTANICAL REMAINS:						
THE ABSOLUTE COUNTS: BY TRENCHES						
	TRENCHES					
DATA	S2	S5	S6	S8	S9	TOTALS
Flot vol. (litres)	320	199.5	403.5	174.7	576.2	1675
L.F. Carbonized mat. vol. (ml)	28	4	63	28	57	180
Total Carbonized seeds	128	16	203	89	41	477
Total Identified Carbonized seeds	98	12	144	81	34	369
Carbonized Eleusine sps.	33	1	32	3	4	73
Carbonized Panicum sps.	10	0	9	1	1	21
Carbonized Setaria sps.	15	0	11	2	2	30
Carbonized Pennisetum sps.	0	3	4	1	0	8
Total Carbonized Millets (Ident.)	58	4	56	7	7	132
Carbonized Legumes	6	1	7	1	2	17
Carbonized Weeds (Total)	6	3	24	64	18	115
Carbonized Trianthema	5	1	18	63	15	102
Carbonized Amaranthus/Chenopodium	0	0	5	0	1	6
Carbonized Polygonum	0	0	0	0	1	1
Carbonized Unidentified Seed A	1	0	0	1	1	3
Carbonized Euphorbia	0	2	1	0	0	3
Carbonized Unidentifiable millets	6	4	22	3	0	35
Total Carb. Non-diagnostic seeds	30	4	59	8	7	108

ORIYO TIMBO 1989-1990 ARCHAEOBOTANICAL REMAINS:						
THE STANDARDIZED DATA: BY TRENCHES						
	TRENCHES					
DATA	S2	S5	S6	S8	S9	TOTALS
Flot vol. Standardized 1000 litres						
L.F. Carbonized mat. vol. (ml)	88	20	156	160	99	107
Total Carbonized seeds	400	80	503	508	72	285
Total Identified Carbonized seeds	306	60	356	463	59	220
Carbonized Eleusine sps.	103	5	79	17	7	44
Carbonized Panicum sps.	31	0	22	6	2	12
Carbonized Setaria sps.	47	0	27	11	3	18
Carbonized Pennisetum sps.	0	15	10	6	0	5
Carbonized Millets (Ident.) Total	181	20	139	40	12	79
Carbonized Legumes (Total)	19	5	17	6	3	10
Carbonized Weeds (Total)	19	15	59	366	31	69
Carbonized Trianthema	16	5	44	360	26	61
Carbonized Amaranthus/Chenopodium	0	0	12	0	2	4
Carbonized Polygonum	0	0	0	0	2	0.6
Carbonized Unidentified Seed A	3	0	0	6	2	2
Carbonized Euphorbia	0	10	2	0	0	2
Carbonized Unidentifiable millets	19	20	54	17	0	21
Carb. Unidentified Non-diagnostic seeds	94	20	146	46	12	64

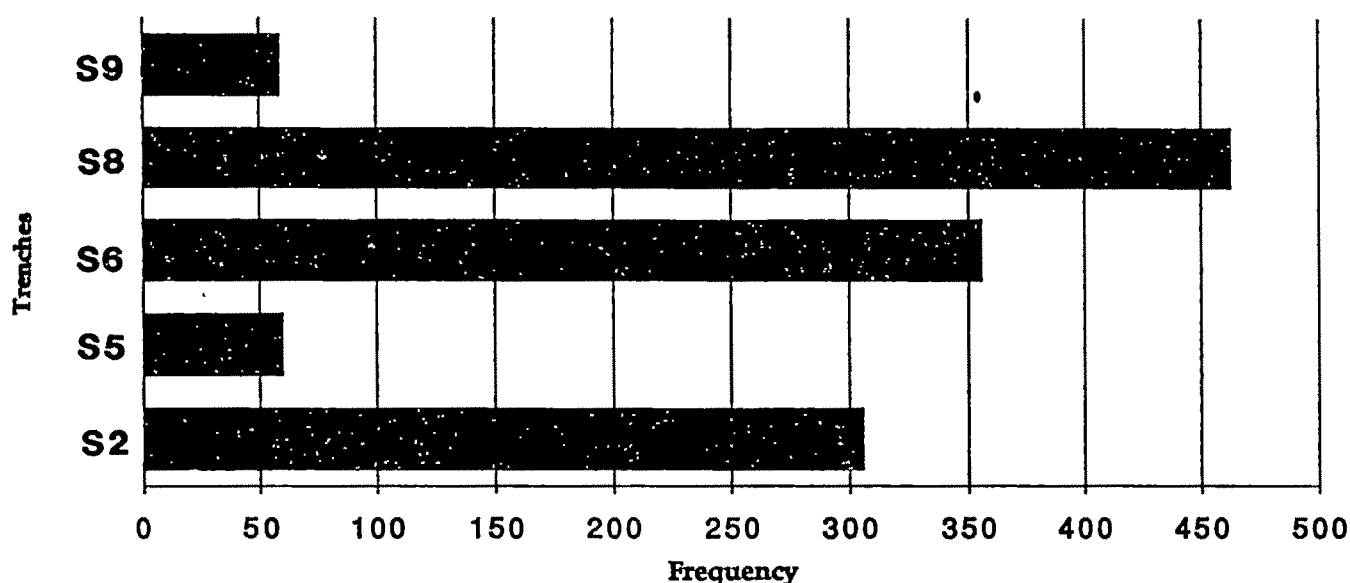


Fig. 1: Total identified carbonized seeds

layers of soil were identified in the course of the excavation, but they comprised no more than 3 distinguishable occupations. The upper layers of the site are associated with the top soil and the plough zone and are extremely disturbed. Strata 1 and 2, are distinct from stratum 3 which is a series of very compacted soil layers and artefact concentrations. The excavators consider this to represent the last occupation surface at this site. Stratum 4, a softer compacted fill is distinct from the compacted series of layers in stratum 5. This stratum has high ceramic densities and also features associated with food preparation (i.e. *chulas*, a *tandoor*, ash pits). Stratum 6, a soft fill, separates the next series of compacted occupation surfaces (6a, 6b, 6c) and extends into the sterile soil of stratum 7.

Archaeobotanical Investigation

The second season of excavations at Oriyo Timbo, resulted in the retrieval of archaeobotanical remains from 247 samples comprising 3139 litres of unscreened dirt from 6 trenches. The objectives of the archaeobotanical recovery and analysis are essentially two-fold: to gain an understanding of the nature of the subsistence economy at the site, and to elucidate the spatial and temporal variations in the plant materials at the site. Obtaining strong contextual information through extensive sampling has been a necessary goal of this study. These goals do not differ extensively from those of the 1981-82 season of recovery and analysis (Wagner 1983a), however, the extensive sampling and barrel flotation

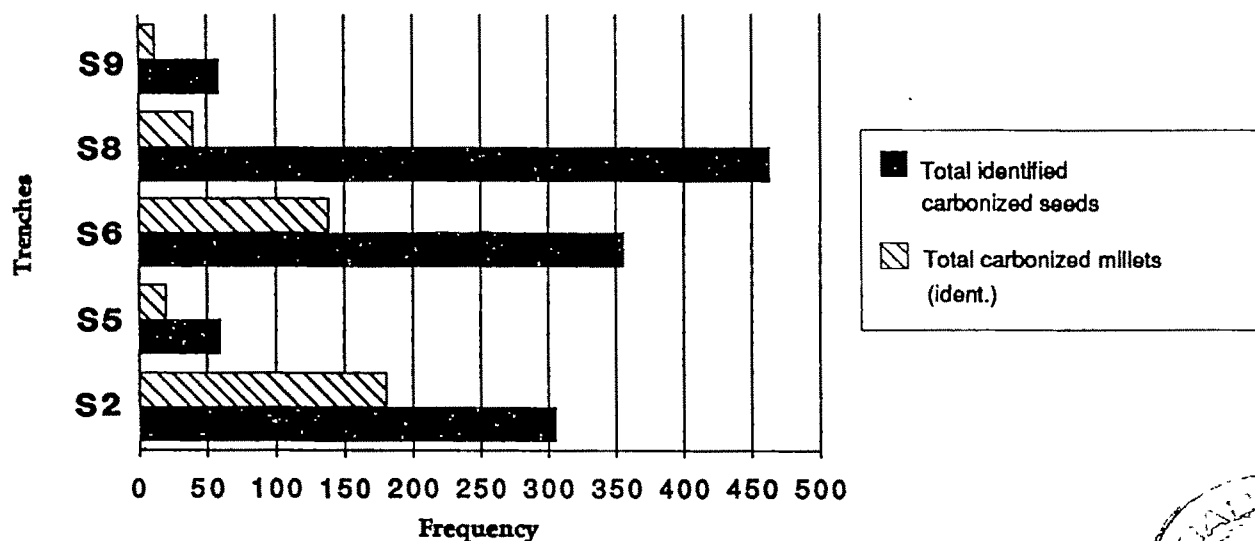


Fig. 2: Frequency ratios of millets



Table 2: Archaeobotanical data: Strata

ORIYO TIMBO 1989-1990 ARCHAEOBOTANICAL REMAINS:					
THE ABSOLUTE COUNTS: BY STRATA					
	STRATA				
DATA	4	5	6	7	Totals
Flot vol. (litres)	307.50	1029.25	273.00	37.50	1647.25
L.F. Carbonized mat. vol. (ml)	18	116	45.5	1	180.5
Total Carbonized seeds	42	294	139	2	477
Total Identified Carbonized seeds	35	236	96	2	369
Carbonized Eleusine spa.	7	45	21	0	73
Carbonized Panicum spa.	3	13	4	0	20
Carbonized Setaria spa.	4	21	5	0	30
Carbonized Pennisetum spa.	0	5	3	0	8
Total Carbonized Millets (Ident.)	14	84	33	0	131
Carbonized Legumes	1	8	6	1	16
Carbonized Weeds (Total)	14	86	14	1	115
Carbonized Trianthema	11	80	10	1	102
Carbonized Cheno./Amaran.	2	1	3	0	6
Carbonized Polygonum	0	1	0	0	1
Carbonized Unidentified Seed A	1	2	0	0	3
Carbonized Euphorbia	0	2	1	0	3
Carbonized Unidentifiable millets	1	12	22	0	35
Total Carb. Non-diagnostic seeds	7	58	43	0	108

ORIYO TIMBO 1989-1990 ARCHAEOBOTANICAL REMAINS:					
THE STANDARDIZED DATA: BY STRATA					
	STRATA				
DATA	4	5	6	7	Totals
Flot vol. Standardized 1000 litres					
L.F. Carbonized mat. vol. (ml)	58	113	167	27	365
Total Carbonized seeds	136	286	509	53	984
Total Identified Carbonized seeds	114	229	352	53	748
Carbonized Eleusine spa.	23	44	77	0	144
Carbonized Panicum spa.	10	13	15	0	38
Carbonized Setaria spa.	13	20	18	0	51
Carbonized Pennisetum spa.	0	5	11	0	16
Total Carbonized Millets (Ident.)	46	82	121	0	249
Carbonized Legumes	3	8	22	27	60
Carbonized Weeds (Total)	46	84	51	27	208
Carbonized Trianthema	36	78	37	27	178
Carbonized Amaranthus/Chenopodium	6	1	11	0	18
Carbonized Polygonum	0	1	0	0	1
Carbonized Unidentified Seed A	3	2	0	0	5
Carbonized Euphorbia	0	2	4	0	6
Carbonized Unidentifiable millets	3	12	80	0	95
Carb. Unidentified Non-diagnostic seeds	23	56	158	0	237

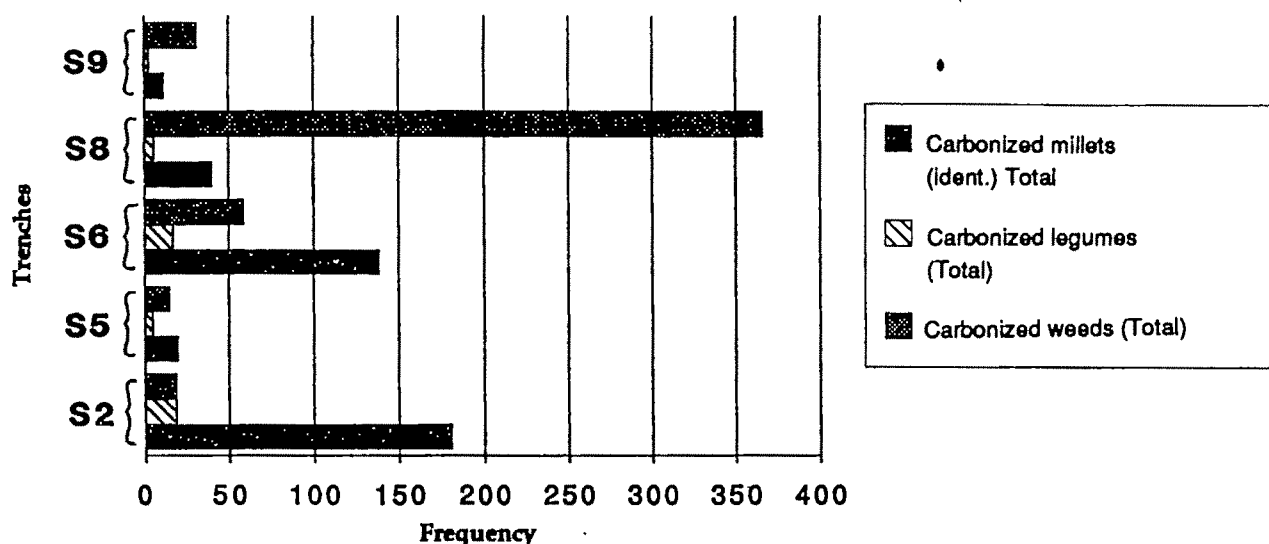


Fig. 3: Frequency ratios of carbonized millets, legumes and weeds

of the last season do account for variations in the recovery rates and comparability. Moreover, since similar recovery and sampling methods were used at Rojdi (Weber 1989), the data from these two sites are comparable. Analysis of some samples from the 1989-90 season is still pending and a complete study of the entire collection is expected by the end of 1991. Hence, this report is an account of the analysis done to date. Ultimately, the archaeobotanical data will be used to test ethnographic models of summer crop processing stages developed through future research by the author in Gujarat and Andhra Pradesh.

During the 1989-90 season, plant remains were recovered in the form of carbonized and uncarbonized seeds. The majority of seeds were small and homogeneously scattered

through the sediment. They include summer crop plants such as *Eleusine*, *Panicum*, *Setaria*, a variety of legumes and a range of weed species. The plant remains occur in varying frequencies in all the trenches, but high concentrations occur in only 3 of the 6 trenches. The associated material culture is of the Lustrous Red Ware cultural sequence, and radiocarbon dates are expected from the 1989-90 excavations.

Methods of Archaeobotanical Recovery

A highly representative archaeobotanical assemblage would include all the plant species actually in use at a site along with some indication of the relative importance of the remains in antiquity. Adequate sampling from a sufficiently large number of contexts is imperative to achieve such an

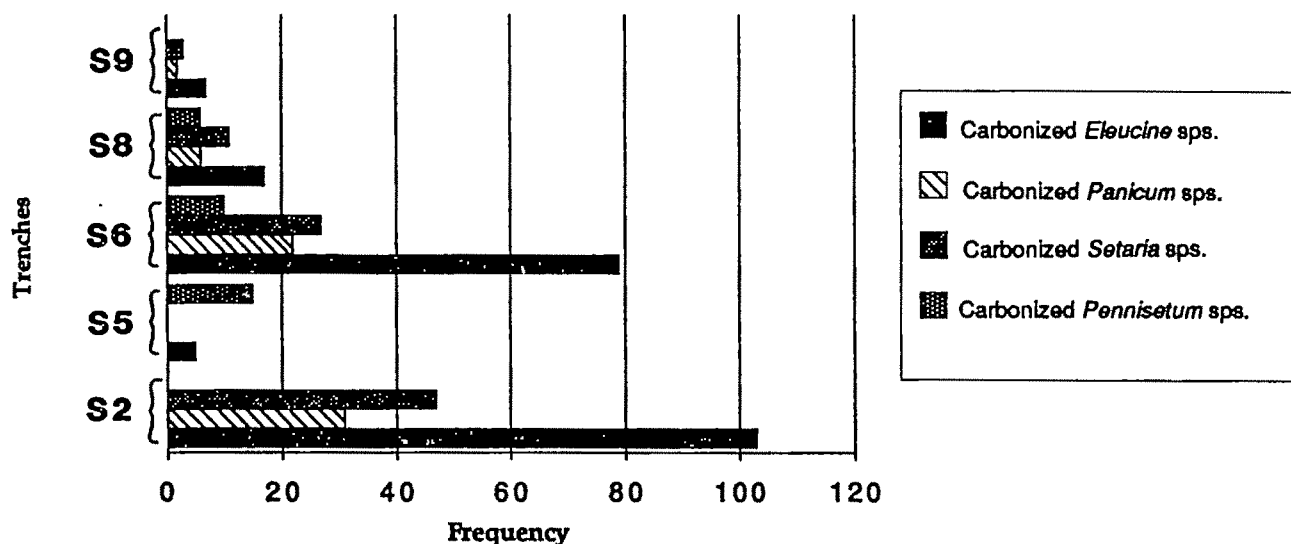


Fig. 4: Frequency ratios of various millets

Table 3: Measurements of carbonized seeds

Genus	Length (mm)	Width (mm)	Thickness (mm)
Eleusine	1.10	0.90	0.80
Panicum	1.40	1.00	0.90
Setaria	1.40	1.10	0.50
Pennisetum	1.90	1.50	1.30
Trianthema/Mollugo	1.10	1.00	0.80
Euphorbia	1.60	1.10	
Polygonum	1.40	1.00	0.80
Seed A	2.00	1.80	1.10

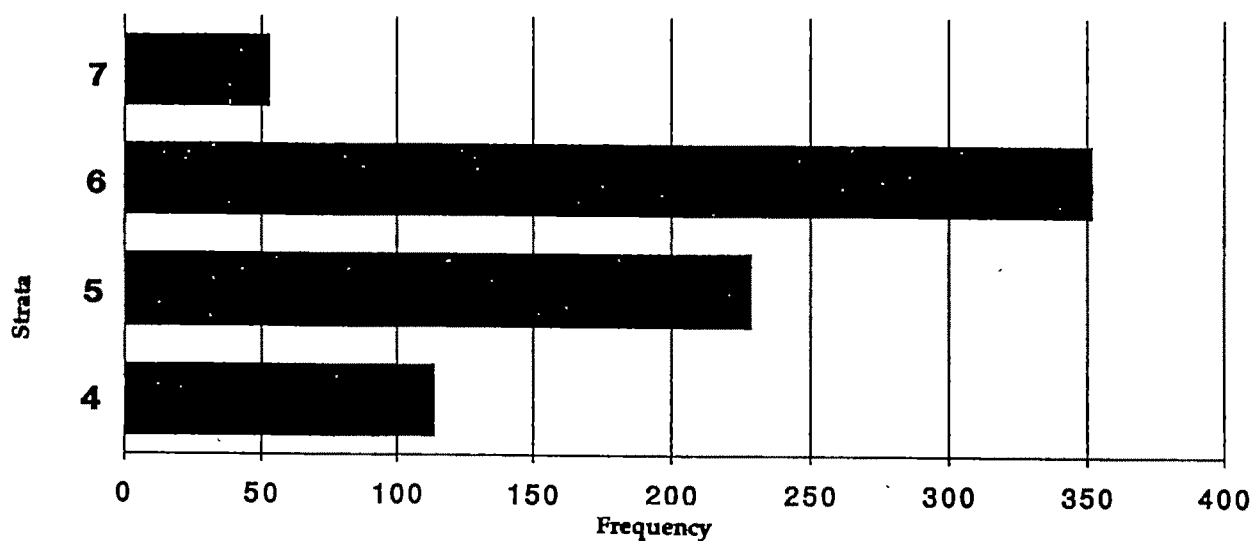


Fig. 5: Total identified carbonized seeds by strata

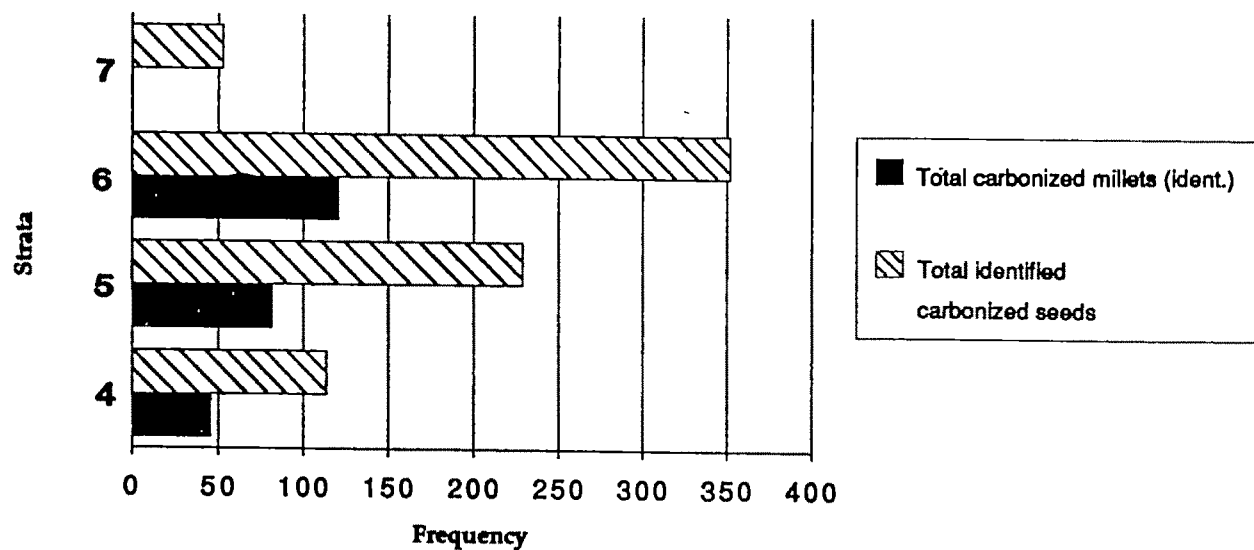


Fig. 6: Frequency ratios of millets in different strata

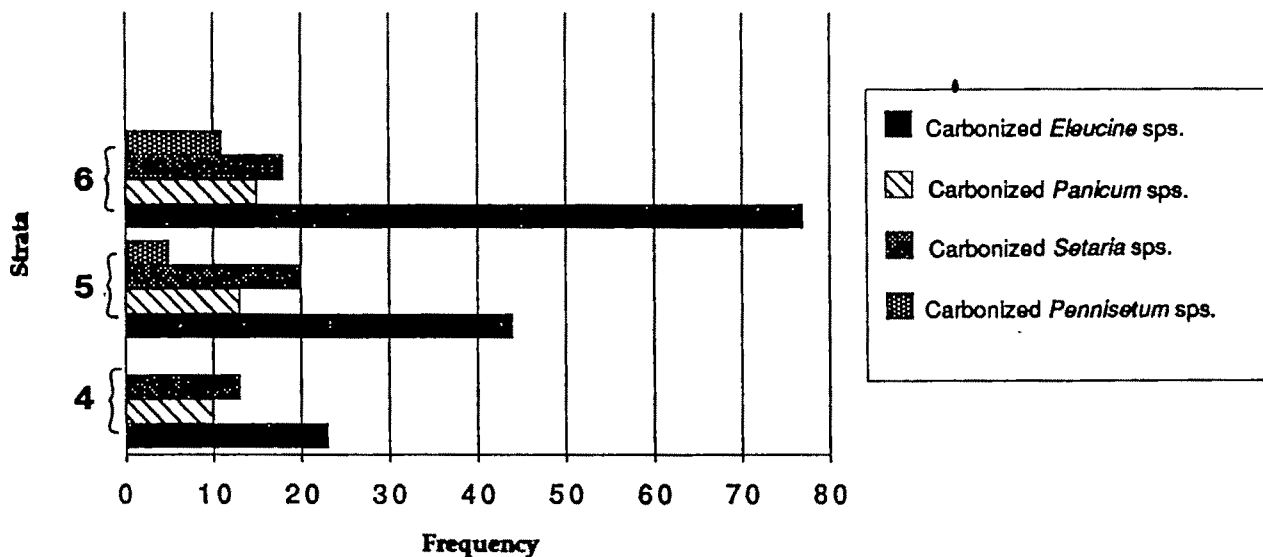


Fig. 7: Frequency ratios of various millets in different strata

assemblage. Therefore, to ensure adequate plant retrieval from the site, detailed sampling was employed: 3139 litres of archaeological sediment from 247 samples were processed, with a minimum volume of 10 litres per sample unless there was a defined feature. The sample contexts include hearths, ovens, compact living floors, dumps, pits and fill areas. As noted, such sampling methods are necessary for the successful identification of macro-assemblages and localized associations related to different economic activities such as plant processing, consumption and disposal.

The water flotation system used for plant recovery at Oriyo Timbo was comprised of an oil tank (with its top removed) which was connected to a continuous water supply. This tank was designed for the Rojdi project and used previously by Weber (for an illustrated discussion of the flotation system refer to Weber 1989).

Special emphasis was given to having standardized control on the volume of sediment processed. A standard of 10 litres was taken for each float sample, unless it was a feature, feature fill or a floor. In order to ensure a good yield of seeds specific to contexts, as often as possible every feature or feature fill was processed. A bucket which was marked and recorded was used for this process. When a sample was over 10 litres, it was spilt up and processed in lots of 10 litres, and later after drying, the respective heavy and light fractions were combined. This strategy was adopted to facilitate a consistent recovery process. When the samples were clayey and clumpy, they were pre-processed before flotation. Typically these samples were hearth features which were sun baked after exposure. The clumps were broken gently by hand before flotation. To avoid losses due to chemical reactions, baking soda or any other equivalents were not used to aid in this process.

The system was run for 15 minutes every morning before any samples were processed to wash out the tank and avoid contamination both from previous samples processed and exterior elements. The heavy fraction basket was also washed out thoroughly after every sample, to ensure minimal contamination. The tank bottom where the washed sediment settles was cleaned out when the water started getting turbid. The water supply was maintained as continuous as possible given the constraints of the field situation. It usually took some 20 minutes to float 10 litres of dirt. This also included note taking and label making. The sediments were described whenever appropriate. In general, the upper levels (1, 2, 3, 4) were impregnated with many rootlets and root hairs. The lower levels (5, 6, 7) also had them, but in lesser quantities. On an average, about 70 litres were processed before the tank had to be cleaned out.

When each float sample was processed, first the context was noted and volume measured before it was deposited into the heavy fraction screen in the flotation tank. The outflowing light fraction was caught continuously in the box, while the sediment was agitated gently by hand to help break the soil lumps. Once the sample was processed, the heavy fraction box was lifted and emptied out to dry on labeled newspapers laid out in the sun. The light fraction bag was tagged and hung on a clothesline to dry. The heavy fraction bucket, the measuring bucket and the walls of the tank were washed out thoroughly before the next sample was processed.

After the heavy fractions were dry, they were sieved through geological sieves with 4.0, 2.0 and 0.4 sq mm openings. The contents from each of these screens were sorted and recorded. The plant remains were combined with the corresponding light fraction and stored in plastic vials.

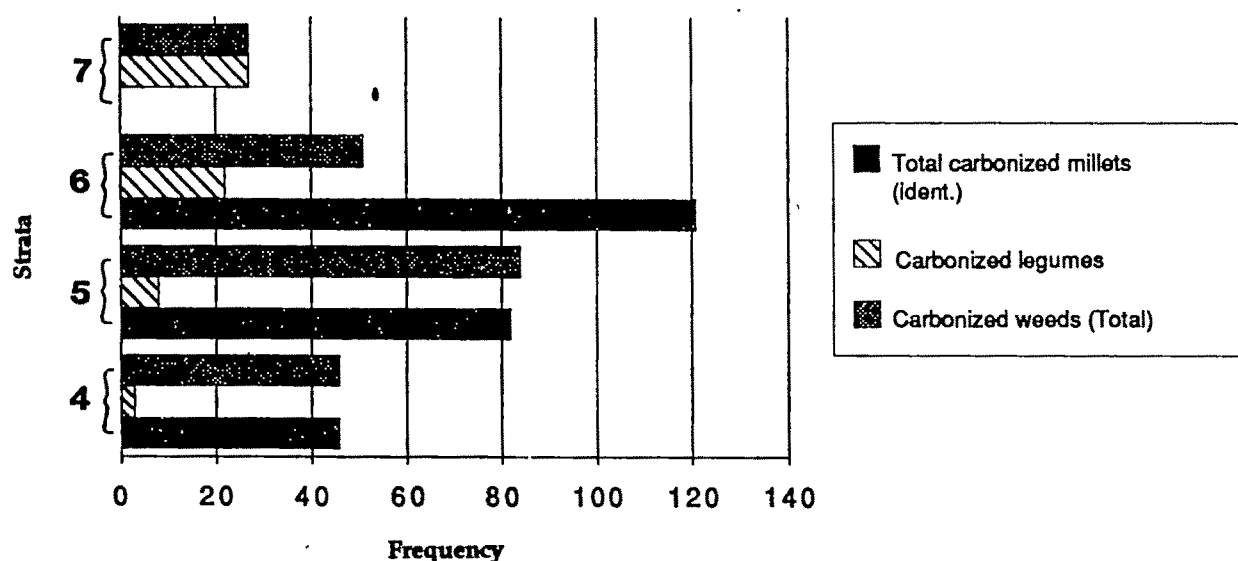


Fig. 8: Frequency ratios of carbonized millets, legumes and weeds in different strata

Careful attention was given to keeping contamination to a minimum at every step. All the lithics, bones, pottery and other artefacts were recorded and bagged separately to be sent to the appropriate analysis stations. Because of the speedy flotation and extensive sampling, there is a backlog of heavy fraction sorting. The light fractions were emptied out of the cheese cloths and stored in plastic vials for analysis at a later date.

As it is with most if not all plant recovery systems, the major concern during flotation was to minimize loss, contamination and damage to the plant remains. As discussed, the Oriyo 1989-90 recovery methods minimized these concerns by thorough cleaning of the flotation tank, heavy fraction screen and the light fraction box. The use of a continuous water supply automatically acted as a control for much of this.

Archaeobotanical Analysis

The first step in the analysis was to scan the light fraction sample for seeds using a binocular dissecting microscope at 10X and 20X. Comparative samples were used for seed identification. The presence of *Eleusine*, *Panicum* and *Setaria* along with other associated weeds, suggests possible cultivation of summer crops. Weeds such as *Trianthema/Mollugo* and *Chenopodium/Amaranthus* are also present in relatively high proportions. Since the archaeological context of trench S4 was disturbed, only 2 archaeobotanical samples were analyzed both of which were sterile. Hence, only archaeobotanical data from the other 5 trenches S2, S5, S6, S8 and S9 are discussed here.

To date 50% of the samples have been sorted and analyzed, yielding a total of 477 carbonized seeds of which 369 are identified. Of the latter 36% are 'millets' (summer

crops) and 31% are weeds. Among the millets, *Eleusine* comprises 20% of the total seed assemblage, followed by *Setaria* (8%), *Panicum* (6%) and *Pennisetum* (2%). Legumes constitute 5% of the total assemblage. Among the weeds, *Trianthema/Mollugo* (28%) comprises the highest percentage (see Tables 1 and 2 for absolute counts and standardized data).

Detailed Species Discussion

Eleusine sps.: A total of 73 carbonized *Eleusine* caryopses were recovered from 5 trenches, with trench S2 having the highest frequency ratio. Of these more than 80% were measurable, and the measurements averaged 1.1 mm in length, 0.9 mm in width and 0.8 mm in thickness (Table 3). It was consistently noted that during carbonization the sides of the grain were often pulled apart, which spilt the apex open and exposed the interior. This form of distortion was most frequently noted for *Eleusine* grains. Standardization of the data (Table 2), showed that *Eleusine* occurs in highest frequencies in stratum 6, followed by stratum 5. Stratum 4 has relatively few grains. These data do not correlate well with Wagner's results (1983), which had the highest number of *Eleusine* grains in Strata 2 and 3, with stratum 4 having only 1 contaminant grain.

Panicum sps.: 21 carbonized grains of *Panicum* were recovered. This comprises 6% of the total carbonized seed assemblage at the site. Standardized data show that *Panicum* occurs in highest frequency ratios in stratum 6 and Trench S2. The average measurements of these grains were 1.4 mm for length, 1 mm for width and 0.9 for thickness. As in the case of *Eleusine*, there is uniformity in the measurements of *Panicum* grains which could have interesting implications that will be investigated later.

Setaria spp.: A total of 30 carbonized seeds identified as *Setaria* were recovered from 4 of the 5 trenches. Trench S5 had no *Setaria* or *Panicum* grains, and as expected Trench S2 has the highest frequency ratio. In general, Trench S5 has a very low frequency of millet grains, and carbonized seeds in general. Stratigraphically, *Setaria* occurs in the highest frequency in stratum 5. Several species may be represented by this assemblage, and further detailed identifications are needed. The measurements averaged 1.4 mm for length, 1.1 mm for width and 0.5 mm for thickness.

Pennisetum spp.: 8 carbonized seeds have been tentatively identified to be *Pennisetum* spp. They occur in Trenches S5, S6 and S8, in strata 5 and 6. At this point nothing is suggested by their presence, as reconfirmation and completion of data analysis is needed to further understand the implications of their presence. All the seeds are well preserved, and on average measure 1.9 mm in length, 1.5 mm in width and 1.3 mm in thickness.

Legumes: A variety of legumes have been recovered from all 5 trenches, totalling 17 carbonized seeds. Standardized data shows that S2, and strata 6 and 7 have the highest frequency of legumes. The presence of legumes or of any other seeds in general in stratum 7, which is a sterile layer archaeologically, can be explained by the infiltration of seeds through the sediment and other pedological activities.

Trianthema/Mollugo: A total of 102 carbonized seeds were recovered belonging to this genera. Their highest frequency occurs in S8 and in stratum 5. The seeds measure 1.1 mm in length, 1.0 mm in width and 0.8 mm in thickness. The seeds have a distinctive marked surface of rugulose lines in curved rows, the curving follows the coil of the seed embryo.

Miscellaneous Seeds: 3 seeds of *Euphorbia* and 1 seed of *Polygonum* comprise this category. They are too rare and infrequent to warrant comment upon their occurrence in a specific trench or stratum. The *Euphorbia* seeds average measurements are 1.6 mm in length and 1.1 mm in width, while the one *Polygonum* measures 1.4 mm in length, 1 mm in width and 0.8 mm in thickness.

Seed A: The most enigmatic seeds in the entire assemblage are 3 unidentified round seeds, which occur in 3 different trenches. They are well carbonized, and show no distortion. They measure on the average 2 mm in length, 1.8 mm in width and 1.1 mm in thickness. They are round with very tiny and not very prominent surface spikes. The seeds taper sharply to an apex, and maintain their round shape.

Contextual, Spatial and Stratigraphic Variability

Contextual Patterns: Of the analyzed samples, the following pattern is observed. Trenches S2 and S5 have no samples from features, while Trench S6 has 3 samples from feature, feature fill, and fill outside a feature. Stratigraphically all the three features are in strata 5 and 6, containing carbonized seeds of *Eleusine*, *Trianthema*, *Panicum* and *Setaria*. *Trianthema/Mollugo*

occurs most often in association with *Eleusine* and *Panicum*. The implications of such associations will be further investigated and tested after the completion of data collection from all the Oriyo Timbo archaeobotanical samples.

Trench S8 has 5 features. The feature shaped like a keyhole in stratum 5 is sterile, while the other samples from features, ash pits, and fill above a *chula*, have seeds of *Eleusine*, *Setaria*, possible *Pennisetum*, Legumes, *Trianthema/Mollugo* and unidentifiables. The fill above the *chula* has *Trianthema/Mollugo* and legumes.

Trench S9 has samples from 20 features. All the samples in stratum 4 are sterile for carbonized plant remains, however, the samples from stratum 5 have preserved carbonized seeds. The contexts of these samples are fills, features and deposits above features. Included here are the *tandoor* wall which was sterile for carbonized plant remains, and the *tandoor* fill which had one carbonized *Trianthema/Mollugo* seed and much charcoal. Sediments from three *chulas* in Trench S9 were also processed for plant remains. Of these only one *chula* has scanty plant materials preserved, comprising one *Eleusine* seed.

Carbonized plant remains appear to be differentially preserved depending on the context. Contexts with the highest probability of fire, i.e. high temperatures, such as the hearth samples and the *tandoor* fill contents and the *tandoor* wall, appear to have the lowest frequency of carbonized seeds. Whether this correlation is a result of a lack of preservation due to the high temperatures in these contexts, or a result of no seeds being associated with or incorporated into these contexts will be investigated upon completion of data collection. It seems most likely that the highest frequency of seeds will occur in samples from deposits above and below features, due to depositional processes during and after these activities.

Miller and Smart (1984) have suggested that a significantly high percentage of archaeobotanical materials retrieved from living floors, hearths and ovens are preserved as a result of dung being intentionally burnt as fuel and also used for plastering of floors. However, it is very likely that the grains included in the dung could have come from elsewhere (i.e., inclusions when the dung was dropped, dried, packed, etc.) rather than just from the animal's digestive system. These variables can only be controlled and explained upon a thorough understanding of the context of the archaeological sediment. Alternatively, dung need not be the primary source of seeds in archaeological sediments. Crop by-products are also often used as fuel in the Third World, although millet by-products rank quite low as attractive domestic fuels when compared to wheat, barley and sugarcane crop by-products (Barnard and Kristoferson 1989: 79).

Spatial Trends: The absolute counts of the carbonized seeds were standardized into frequency ratios per 1000 litres of

sediment, so that the data from different trenches could be easily compared (Table 1). This has shown a variation in the distribution of carbonized seeds among the trenches. Trench S8 has the highest frequency ratio with 463 seeds per 1000 litres, S6 and S2 follow with 356 and 306 seeds per 1000 litres (Fig. 1). S5 and S9 have the lowest frequencies with 60 and 59 seeds per 1000 litres. Although trench S8 has the maximum number of features and ash pits, at this stage there does not appear to be a direct association between the context of the sample and the density of seeds recovered. Instead the author tentatively suggests that there might be an indirect association related to fills above and below features which needs to be further investigated. Millets (summer crops) occur in highest frequencies in Trench S2 and S6, with S8 falling in the middle, and S5 and S9 having the lowest frequencies (Fig. 2). The genera distribution is quite consistent in that the various millets occur in similar frequencies in all the trenches (i.e., highest frequency in trench S2, and lowest in S9) (Fig. 4). It is interesting to note that Trench S5 does not have any *Panicum* and *Setaria*.

Stratigraphic Patterns: Stratigraphically, relative frequency variation is as expected, with stratum 7 having the lowest frequency of carbonized seeds (Table 2 and Fig. 5). Stratum 6 has the highest frequency, followed by 5 and 4. These results correlate well with the archaeological stratigraphy, and the carbonized seeds found in the sterile stratum 7 probably filtered down through the sediment by various pedological activities. The distribution of millets and legumes follow similarly, with stratum 6 having the highest frequency, but weeds occur in highest frequency in stratum 5 (Fig. 8). The implications of this variation will be explored upon completing the analysis of the remaining samples, if similar patterning is maintained in those samples also. Stratigraphically, *Eleusine*, *Panicum* and *Pennisetum* occur in the highest frequency in stratum 6 followed by 5 and 4 (Fig. 7). *Setaria*, however, occurs in the highest frequency in stratum 5, followed by 6 and 4, though the variation is small.

Thus, initial inspection and observations of the Oriyo Timbo archaeobotanical samples suggest that the distribution of carbonized seeds at the site seem not to be concentrated in any functional locus, such as a hearth or oven. In fact, the samples from these contexts, show a relatively low density of seeds as compared to the general sediments from the different trenches. This may be due to several reasons, the most probable would be that the preservation of seeds in these contexts is lower due to the high temperatures of cooking and burning which would totally destroy the archaeobotanical material. Further discussion of these patterns will be undertaken upon completion of the data collection.

Further Research

Apart from completing the data collection, there are several important questions that need to be answered before we can

fully understand the Oriyo Timbo subsistence economy. This includes whether the summer crops were cultivated at the site or nearby, as opposed to bringing in the grain from other localities. Equally important is the need to elucidate the economic importance of these crops to the Oriyo Timbo inhabitants. Was cultivation of these crops a primary subsistence activity, or were there other supplementary activities such as herding of cattle, seasonal migrations, and pastoralism as complementary subsistence activities, as suggested by the first season of excavations in 1982 (Rissman 1985; Rissman and Chitalwala 1990).

The approach taken by the author to effectively address these issues, involves the examination of complementary data from ethnographic studies of crop husbandry, to build archaeologically applicable models to determine whether summer crops were cultivated at the site or grown elsewhere. Specifically, the objective of this ethnographic crop processing study is to identify whether millets are processed differently depending on whether they are grown only as human food, both as human food and animal fodder, or when grown only as fodder.

The principle behind this study is that each step of crop husbandry and grain processing has a measurable effect on the composition of crop products and by-products. These effects will be studied and 'cause-and-effect' models will be built and applied to archaeological samples, enabling inferences to be made on the archaeological use of specific crops. The ethnographic observations isolate characteristic variables which distinguish crop processing stages when millet by-products are used as animal fodder. Detailed ethnographic research for quantitative discrimination among the variables that correlate the cultivation of millets with their ultimate use is being designed. The ethnographic crop processing fieldwork will take place in settled village communities practicing traditional agriculture in Gujarat and Andhra Pradesh, specifically chosen for the ethnographic research because millets are the principle summer crops, and the harvesting is done through non-mechanized traditional methods.

Conclusions

Archaeobotanical remains provide significant data to study past economies and subsistence systems. It is nonetheless important to realize the limitations of this data set, mainly in controlling for unknown factors of deposition, preservation and recovery. But as the continued detailed study of the data set from Oriyo Timbo will reveal, plant remains have several qualities that make them highly valued as archaeological 'artefacts'. These attributes are obvious once the limitations are realized and complemented by other sources of relevant data, such as the ethnographic crop processing and farming studies that the author is undertaking.

To summarize the Oriyo Timbo 1989-90 archaeobotanical results it is appropriate to say that given the analysis

done to date, there is strong evidence for the use of summer crops. Amongst the trenches there is patterned variation in the frequencies of carbonized seeds recovered. S8 has the highest frequency of weed seeds, which accounts for it having the highest frequency of total carbonized seeds. S2, however, has the highest frequency of millets. Stratigraphically strata 6 and 5 have higher frequencies of seeds as compared to stratum 4, and seeds are almost absent in stratum 7. Precise correlation between stratum and trench will be done upon completion of data collection, but it does appear that Trench S2 stratum 6 probably is the densest for summer crop (millets) archaeobotanical remains.

Whether these crops were cultivated at the site by the occupants or brought onto the site from elsewhere, is still an unresolved question. However, given the relatively rich assemblage, the lack of storage heaps, and the high number of weeds associated with the summer crops, it is probable that these summer crops were cultivated by the occupants at the site. A thorough ethnographic study of summer crop processing geared to studying the patterns in by-product and product compositions, will enable this issue to be addressed more effectively. This research, designed specifically for archaeological applications, will be done in Gujarat and Andhra Pradesh during 1991-1992.

As compared to the archaeobotanical finds of the first season of excavations at Oriyo Timbo (Wagner 1983b), the 1989-90 season differs primarily in overall recovery rates, which are higher due to the larger quantity of sediment processed through flotation, and due to the more efficient and higher recovery flotation system used in the second season. Even though some interpretations may change with further analysis, the 1989-90 season's archaeobotany has revealed a wider range of summer crops, not to mention a higher frequency of certain crops such as *Eleusine* and *Setaria*. The 1989-90 season's data also include the addition of *Panicum* and *Pennisetum* into the Oriyo Timbo archaeobotanical assemblage first established by Wagner (1983b) in the 1982 season.

In conclusion, it is imperative to emphasize the importance of intensive sampling, as was done in this project, and an efficient flotation system which facilitated a high recovery rate. The completion of the final analysis probably will not change many of the initial observations made in this report, but the additional data coupled with ethnographic data on crop processing and farming, will provide a richer understanding of the subsistence economy at Oriyo Timbo and the Late Harappan subsistence systems in Gujarat.

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Biological Remains from Neolithic and Early Historic Sites, in Cuddapah District, Andhra Pradesh

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Abstract

This paper embodies results of the dry and wet separation techniques carried out in the laboratory on the habitational soil samples of the Neolithic site at Balijapalle and the Early Historic site at Peddamudiyam in Cuddapah District, Andhra Pradesh. The biological remains from Balijapalle include *Abutilon* type, indeterminate seeds, weed seeds, and various insect parts, whereas grains of red gram (*Cajanus cajan* Millsp. type) and Lady's Finger type (*Ablemoschus* type) have been recovered from Peddamudiyam. This is the only evidence of ancient grains from Cuddapah District. This paper also reviews these findings in the light of grain remains recovered from other Protohistoric and Early Historic sites of South India.

Introduction

This paper represents an account of the preliminary study made on the biological remains retrieved from habitational deposits of the Neolithic and Early Historic periods by standard dry and wet sieving methods. The samples were collected from Balijapalle, a Neolithic site and Peddamudiyam, a Neolithic and Early Historic site, in the central Pennar Basin, Cuddapah District, Andhra Pradesh. The biological remains include grains of five species and some insect parts.

Cultural Background

Balijapalle village (14° 29'N: 78° 20'E) is situated about 15 km north-northeast of Pulivendla town. The Neolithic site is located a 100 m northeast of the present village, on the right bank of a local nullah (Fig. 1). The site covers an area of 180 x 120 m and the habitational deposit is about 1.4 m thick. Two trial trenches (T1 2.5 m x 2.5 m and T2 1 m x 1 m) were dug. Each trench has revealed five layers containing cultural material of the Neolithic period. This comprises pottery, pecked and ground stone tools, microliths, disc beads and animal bones. Samples were collected from layers 1 to 4 of the deposit for retrieving biological remains in the laboratory.

Peddamudiyam village (15° 01'N: 78° 27'E) is situated 21 km northeast of Jammalamadugu town, on the left bank of the river Kunderu. The present village is partly situated on

the southern portion of the Early Historic mound. The samples were collected, from a depth of about 2.5 m from the surface from trenches which had earlier been dug out by the villagers. There are two radiocarbon dates, given below, for the Neolithic occupational deposits of Peddamudiyam (Venkatasubbaiah 1988).

Sample I = B.S. 811, Depth 50 cm, Layer (3)
3490 ± 90 B.P. = 1540 B.C. (according to half-life
5730 ± 40 yrs)

Sample II = B.S. 758, Depth 40 cm, Layer (2)
3060 ± 120 B.P. = 1110 B.C. (according to half-life
5570 ± 30 yrs)

In view of the thickness of the habitational deposits at Balijapalle and Peddamudiyam it is possible to assign the same time period for the Neolithic culture at these two sites, pending the determination of radiocarbon dates on charcoal samples from Balijapalle.

Methodology

A total of twenty six representative habitational soil samples were first weighed and subjected to the dry separation method by using an electric shaking machine ('LABHOP') with a B.S.S. sieve set (mesh sizes 0.150 mm, 0.300 mm, 1 mm and 2 mm). Individual samples from each sieve were weighed separately and examined under a stereo-microscope for macro remains. Samples from Peddamudiyam were not subjected to the wet flotation method since the biological

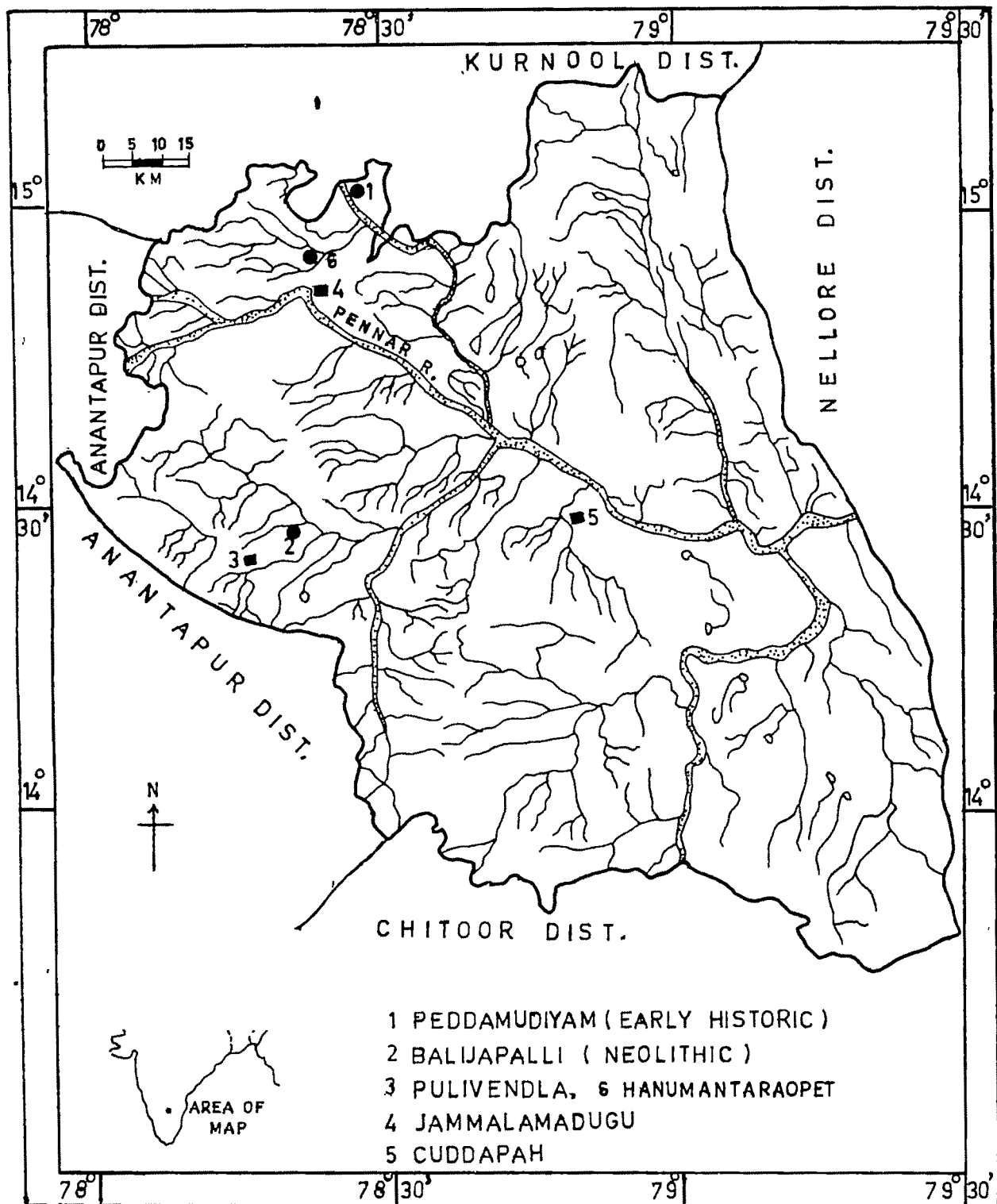


Fig. 1: Location of the sites in Cuddapah District

remains from these samples could be separated by visual observation. The remainder were all subjected to the wet floatation technique in the laboratory. With the help of an electrically operated pump, air was instilled into the tub partially filled with water, thus artificially simulating the effect of running water similar to that of a river. The representative habitation samples were poured into the tub and thus agitated to separate mineral and organic fractions. The biological remains floating on the surface were scooped out with the help of hand sieves. The residue was critically examined for any suspected biological remains and only after ascertaining its minerogenic nature, was the residue discarded. Early Historic Peddamudiyam has provided evidence for biological remains from three samples, Lab. Nos. 2, 2A and 5. The remaining ones are all from Neolithic Balijapalle, Lab. Nos. 6, 7, 8, 9, 10, 12, 15, 16 and 16A. Subsequently, the specimens were studied under a stereo-binocular microscope (25x). The grains were diagnosed on the basis of their external morphological features. In some cases, the carbonisation of seed material has resulted in the splitting of the outer wall of the grains to reveal black patches of the inner food materials. The specimens were photographed under a photomakroscope (Wild-Heerbrugg M-400) using zoom magnifications varying from 2x, 8x, 10x, 16x, 25x to 32x. The sketches were made using 10x magnification under a Citaval stereo-binocular microscope with a drawing tube. The measurements have been made using an eyepiece micrometer under a microscope with 1x and 2x objectives.

Results

Sitewise Summary of the Biological Findings:

Lab. No.	Site and Biological Findings
Neolithic-Balijapalle	
6	Weed seeds (<i>Abutilon</i> sp. type), long indeterminate seeds/insect eggs, insect head, round seed
7	Long indeterminate seeds
8	Long indeterminate seeds
9	Round seed, indeterminate seed
10	Long indeterminate seed
12	Insects' mouth parts
14	Long indeterminate seed
15	Long indeterminate seed
16	Round seeds/insect eggs?, small round weed seeds, insect eye ornamentation
16A	Round seeds?/insect eggs?, small round seed/egg, insect's eye ornamentation
Early Historic-Peddamudiyam	
2	Red gram (<i>Cajanus</i> cf <i>cajan</i> Millsp.), Lady's Finger type (<i>Ablemoschus</i> type)
2A	Red gram (<i>Cajanus</i> cf <i>cajan</i> Millsp.)
5	Red gram (<i>Cajanus</i> cf <i>cajan</i> Millsp.)

Descriptions

a) Red gram (*Cajanus* cf *cajan*? Millsp.)

These grains are oval or rectangular in shape. Twelve grains including cotyledons were recovered from Lab. Nos. 2, 2A and 5. Among them only two grains are well preserved and the rest are cotyledons with plumule depressions. On the well preserved grains a broken outer wall with intermittent black patches were observed.

Measurements in mm (Fig. 2 — a, b, c, f, g and Fig. 3 — d and k)

Length	Breadth	Plumule length
4.24	3.73	1.18
4.83	4.34	1.60
3.38	3.08	-
4.38	3.77	-
2.92	2.62	0.73
2.35	1.98	-
2.25	1.80	-
3.33	2.24	-

b) Lady's Finger type (*Ablemoschus* type)

These are intact and well preserved grains but in some cases the pointed projection (stalk) is broken and the outer walls split open, thus exposing the inner portions of the kernel. A total of fifteen grains were recovered from Lab. No. 2. The grains are oval in shape but the ones without a hylum scar appear slightly oblong in shape.

Measurements in mm (Fig. 3 a, lower row)

Length	Breadth	Length of hylum scar	Breadth of hylum scar
3.89	2.64	-	-
5.40	3.52	110	0.72
5.72	3.64	129	-
4.74	4.00	-	-
4.72	3.88	-	-

c) Weed seeds (*Abutilon* sp.) (Fig. 2h)

Five grains of weeds were obtained from Neolithic Balijapalle. These are angular with projections at one end and a hylum scar in the centre. These may be assigned to the Malvaceae family (*Abutilon* sp.). These were recovered from Lab. No. 6, trench 2, Layer 2.

Measurements in mm.

Length	Breadth
2.93	2.00
2.90	2.40
2.96	2.36
2.98	2.5
2.98	2.58

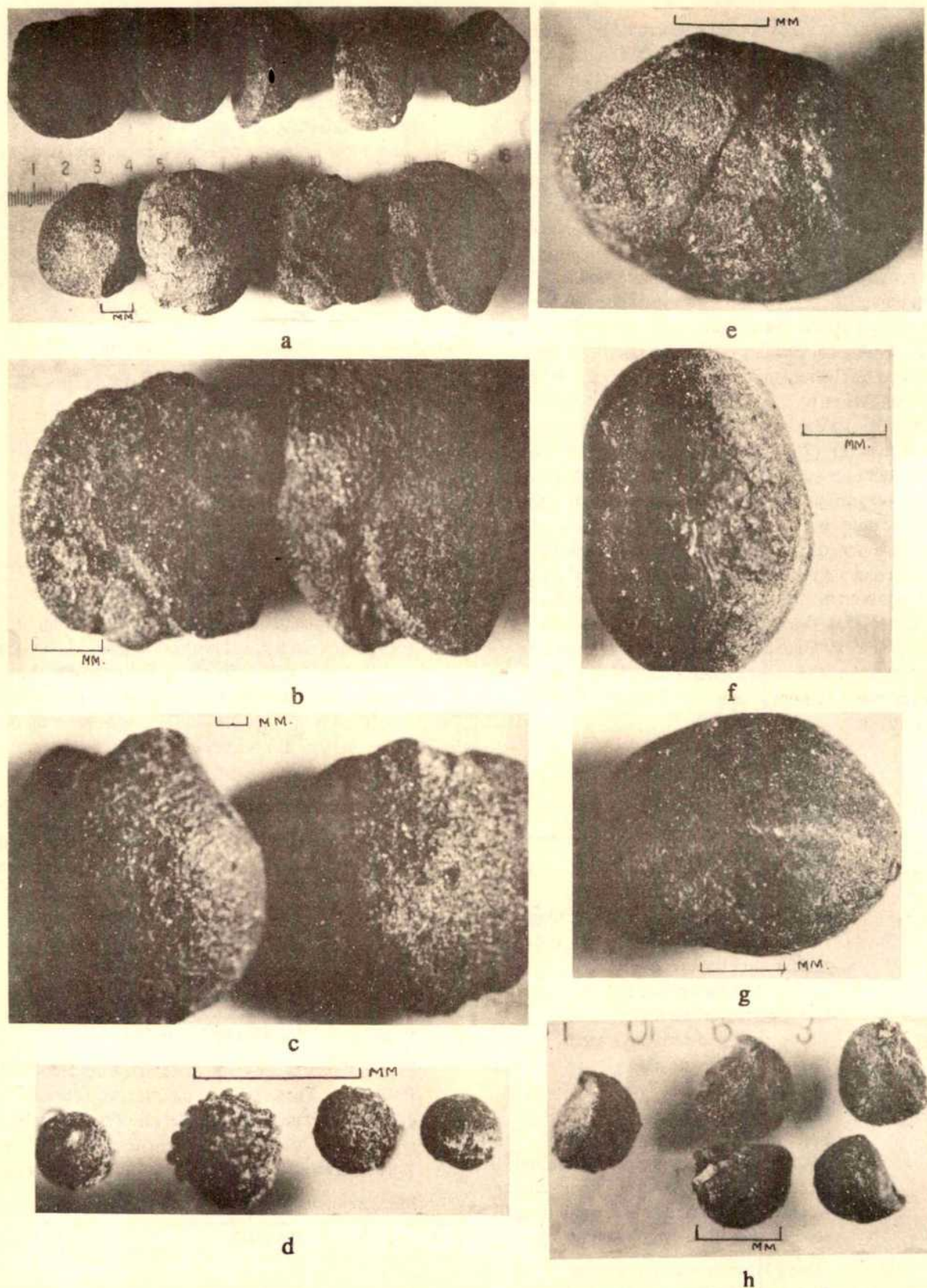


Fig. 2: a. General view of red gram, b. Cotyledons of red gram, c. Outer walls of cotyledons of red gram, d. Round seeds/Insect eggs, e. Red gram intact grain, (*Cajanus cajan* Millsp.), f. and g. Entire grain — Red gram, h. Weed seeds (*Abutilon* type).

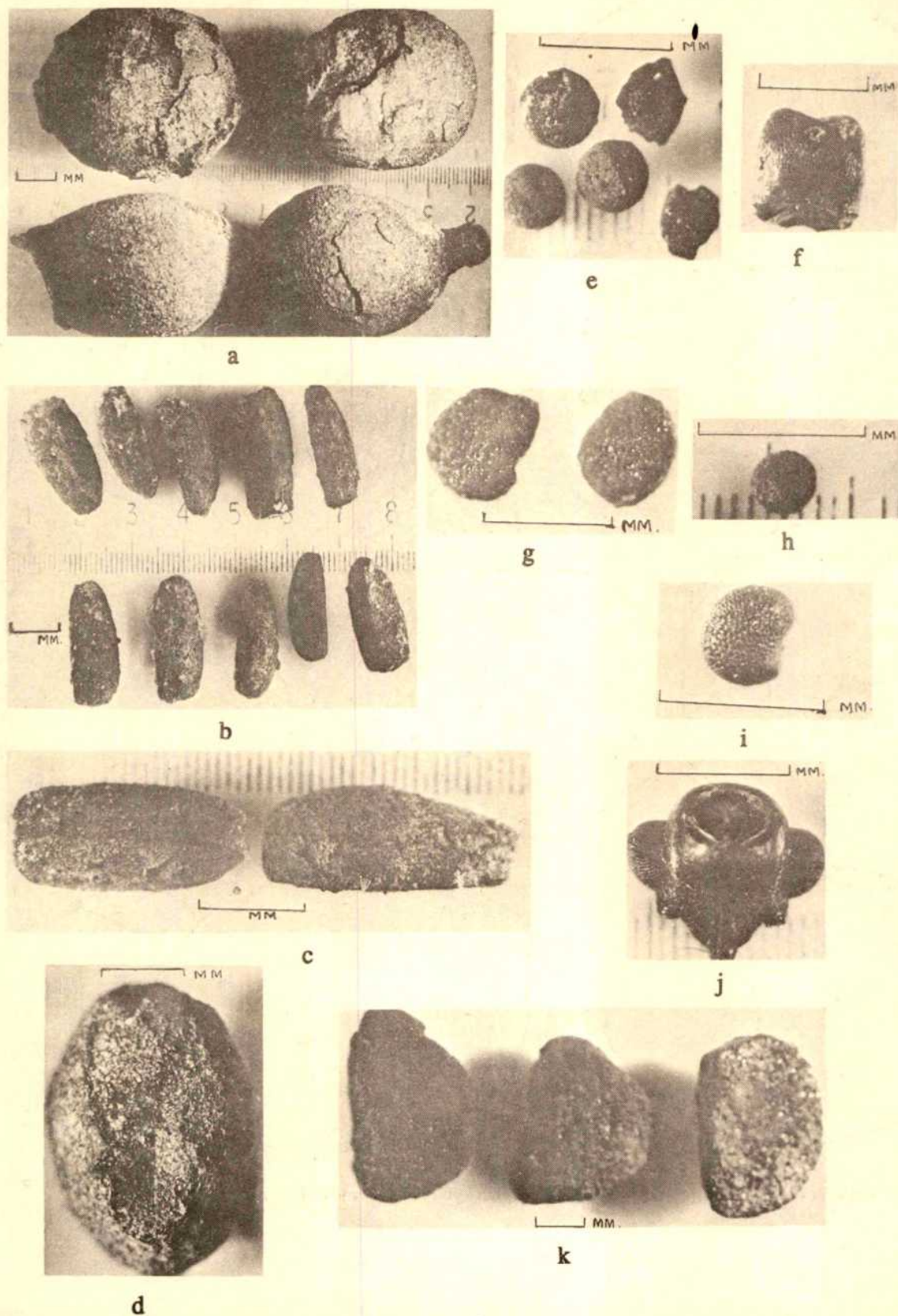


Fig. 3: a. Upper row showing two grains of red gram and the lower row showing two grains of lady's finger type (*Ablemoschus* type), b and c. Indeterminate long seeds (?), d. Entire grain — red gram, e. Round seeds?/Insect eggs? f. Insect head, g. Small round seeds ?, h. Round seed?/Insect egg?, i. Insect eye ornamentation, j. Insect mouth parts with eyes, k. Ill-preserved cotyledons, red gram.

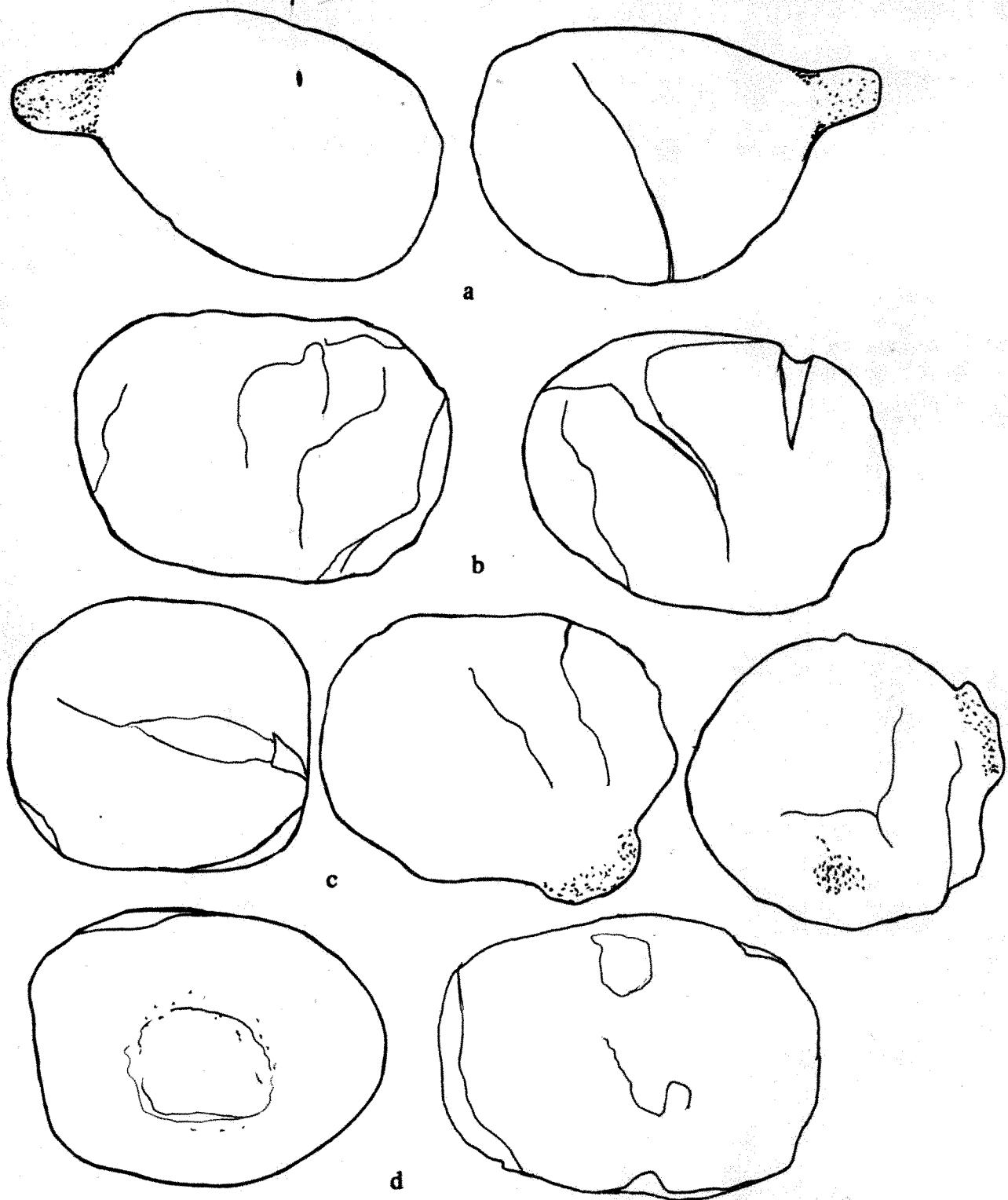


Fig. 4 (not to the scale): a. Lady's finger type, b. Red gram without hylum scar, c. and d. Intact grains of red gram

d) Round seeds?/ insect eggs?

There are four of these structures, obtained from Lab. Nos. 16 and 16 A (trench 2, layer 4). There are no indications of plumule openings or split outer walls except in one case. No hylum scar could be noted. Therefore, it was difficult to correctly identify them.

Measurements in mm (Fig. 2d; Fig. 3 — e and h)

Diameter: 1.25, 1.75, 1.03, 1.08, 1.30, 1.43, 1.60

e) Long indeterminate seeds

These are long seeds with a middle groove and plumule depressions on some of them. Some specimens are broken at the centre thus exposing the inner embryonal tissue. About thirty specimens were recovered from the Lab. Nos. 6 and 10 (trench 2, layer 2 and 3).

Measurements in mm (Fig. 3 b and c)

Length	Breadth
6.24	2.70
5.62	2.25
5.83	2.67
5.94	2.92
6.00	2.27
5.86	2.98
6.46	2.55
5.72	2.45
6.04	2.04
6.15	2.56
5.18	2.33
5.62	2.52

f) Small round seeds

These are eroded grains without any definite shape and therefore difficult to assign to any taxonomic unit. Their dimensions are less than one millimetre (Fig. 3 e and g).

g) Indeterminate seed (Fig. 7 b)

This measures less than 1 mm.

Besides the grains from these sites, remains of parts of insects were also retrieved. They are:

a) Insect's eye parts (Fig. 2 d ; Fig. 3 i)

1.49 mm x 1.38 mm.

b) Insect's mouth parts with two eyes (Fig. 3 j)

3.85 mm x 3.30 mm.

c) Insect's head (Fig. 3 f)

2.80 mm x 2.60 mm.

Discussion

Although there are a few sites belonging to the Neolithic and Early Historic period in the Cuddapah district of Andhra

Pradesh (Venkatasubbaiah 1988), prior to the present discoveries no habitation sites in this district were reported to have yielded plant remains. It is against this background that it was deemed worthwhile to put on record the present evidence of biological remains from Cuddapah District. Even though the site of Peddamudiyam has yielded Neolithic evidence, no plant remains from the Neolithic cultural phase have so far been encountered. There is a strong possibility that detailed work on the Neolithic habitation deposit of Peddamudiyam may, in the near future, yield much awaited information on the plant economy. Grains of red gram have been reported from several sites in Maharashtra, like Chalcolithic Inamgaon (c. 1000 B.C.), Chalcolithic Tuljapur Garhi (c. 1000 B.C.), Megalithic Bhagimohari (c. 800-300 B.C.), Early Historic Bhokardan (c. 100 B.C.-200 A.D.) and Indo-Roman Nevasa (c. 50 B.C.-100 A.D.) (Kajale 1988). The present evidence of the same species from Andhra Pradesh is the only record known so far in South India. In the adjacent district of Kurnool in Andhra Pradesh, 1st millenium B.C. sites like Veerapuram (c. 500 B.C.) have yielded evidence of plant material in the form of grains of rice (*Oryza cf sativa* Linn.), barley (*Hordeum vulgare* Linn.), wheat (*Triticum* sp.), Kodo millet (*Paspalum scrobiculatum* Linn.), lentil (*Lens esculenta* Moench.), the common pea (*Pisum arvense* Linn.), horse gram (*Dolichos biflorus* Linn.), the hyacinth bean (*Dolichos lablab* Linn.), black gram (*Vigna mungo* (L.) Hepper, beleric myrabolan (*Terminalia belerica* Roxb.) and cucurbitaceous types (Kajale 1984). From the Neolithic-Chalcolithic site of Ramapuram in the Kurnool district of Andhra Pradesh, there is evidence of grains of barley (*Hordeum cf vulgare* Linn.), black gram (*Vigna mungo* (L.) Hepper) and hyacinth bean (*Dolichos lablab* Linn.) (Kajale, personal observation; IAR 1980-81). Neolithic sites like Tekkalakota and Sanganakallu (Murty 1989) in Bellary District, Karnataka have yielded remains of wheat (*Triticum* sp.) and horse gram (*Dolichos biflorus* Linn.) (Kajale, personal observations). Similarly, the Neolithic site of Kodekal in Gulbarga district of Karnataka (c. 2300 B.C.) has yielded stones of the fruit of the Indian jujube (*Zizyphus cf jujuba* Lamk.). Vishnu-Mittre (1971) had reported wild and cultivated finger millet (*Eleusine indica* Gaertn. and *Eleusine coracana* (L.) Gaertn.) and kodo millet (*Paspalum scrobiculatum* Linn.) as well as teak (*Tectona grandis* Linn.) from Hallur, District Dharwad, Karnataka. Subsequently, Hilu and de Wet (1976) have, however, contradicted the identification of *Eleusine* spp. from Hallur. From transitional levels between the Neolithic and Megalithic deposits there is evidence of plant remains such as the hyacinth bean (*Dolichos lablab* Linn.), horse gram (*Dolichos biflorus* Linn.), black gram/green gram (*Vigna* sp.) and the Indian jujube (*Zizyphus cf jujuba* Lamk.) from the second seasons' excavations conducted by Nagaraja Rao in 1976 and reported by Kajale (1989a).

Other South Indian sites like Megalithic Gajjalkonda and Fraserpet (District Kurnool, Andhra Pradesh), Mega-

Stratigraphic Summary of the Findings

Figure No.	Site name	Depth in m	Layer	Mesh size in mm	Laboratory No.
2 b	Peddarnudiya	2.50	5	2	2
2 c	Peddarnudiya	2.50	5	2	2
2 d	Baliapalle	0.95	4	0.300	16, 16A
2 e	Peddarnudiya	2.50	5	2	5
2 f	Peddarnudiya	2.50	5	2	2
2 g	Peddarnudiya	2.50	5	2	2
2 h	Baliapalle	0.25- 0.35	2	0.300	6
3 a	Peddarnudiya	2.50	2	2	2
3 b	Baliapalle	0.25- 0.35	2	1	10
3 c	Baliapalle	0.25- 0.35	2	0.300	6
3 d	Peddarnudiya	2.50	5	2	2
3 e	Baliapalle	0.95	4	0.300	16, 16A
3 f	Baliapalle	0.25- 0.35	2	0.300	6
3 g	Baliapalle	0.95	4	0.300	16, 16A
3 h	Baliapalle	0.95	4	0.300	16, 16A
3 i	Baliapalle	0.95	4	0.300	16, 16A
3 j	Baliapalle	0.25- 0.35	2	2	12
3 k	Peddarnudiya	2.50	5	2	2A
4 a	Peddarnudiya	2.50	5	2	2
4 b	Peddarnudiya	2.50	5	2	2
4 c	Peddarnudiya	2.50	5	2	2
4 d	Peddarnudiya	2.50	5	2	2
5 a	Peddarnudiya	2.50	5	2	2
5 b	Peddarnudiya	2.50	5	2	2
5 c	Peddarnudiya	2.50	5	2	2
5 d	Peddarnudiya	2.50	5	2	5
5 e	Peddarnudiya	2.50	5	2	2
5 f	Peddarnudiya	2.50	5	2	2
6 a and b	Peddarnudiya	2.50	5	2	2
6 c	Baliapalle	0.25- 0.35	2	0.300	6
6 d, e, f	Baliapalle	0.25- 0.35	2	0.300	6
6 g	Baliapalle	0.25- 0.35	2	2	7
6 h, i	Baliapalle	0.25- 0.35	2	2	6
6 j, l	Baliapalle	0.25- 0.35	2	1	8
6 k	Baliapalle	0.25- 0.35	2	1	10
6 m	Baliapalle	0.25- 0.35	3	0.300	14
7 a	Baliapalle	0.25- 0.35	4	0.300	9
7 b	Baliapalle	0.25- 0.35	4	0.300	9
8 a	Baliapalle	0.25- 0.35	3	1	15
8 b	Baliapalle	0.25- 0.35	2	1	8

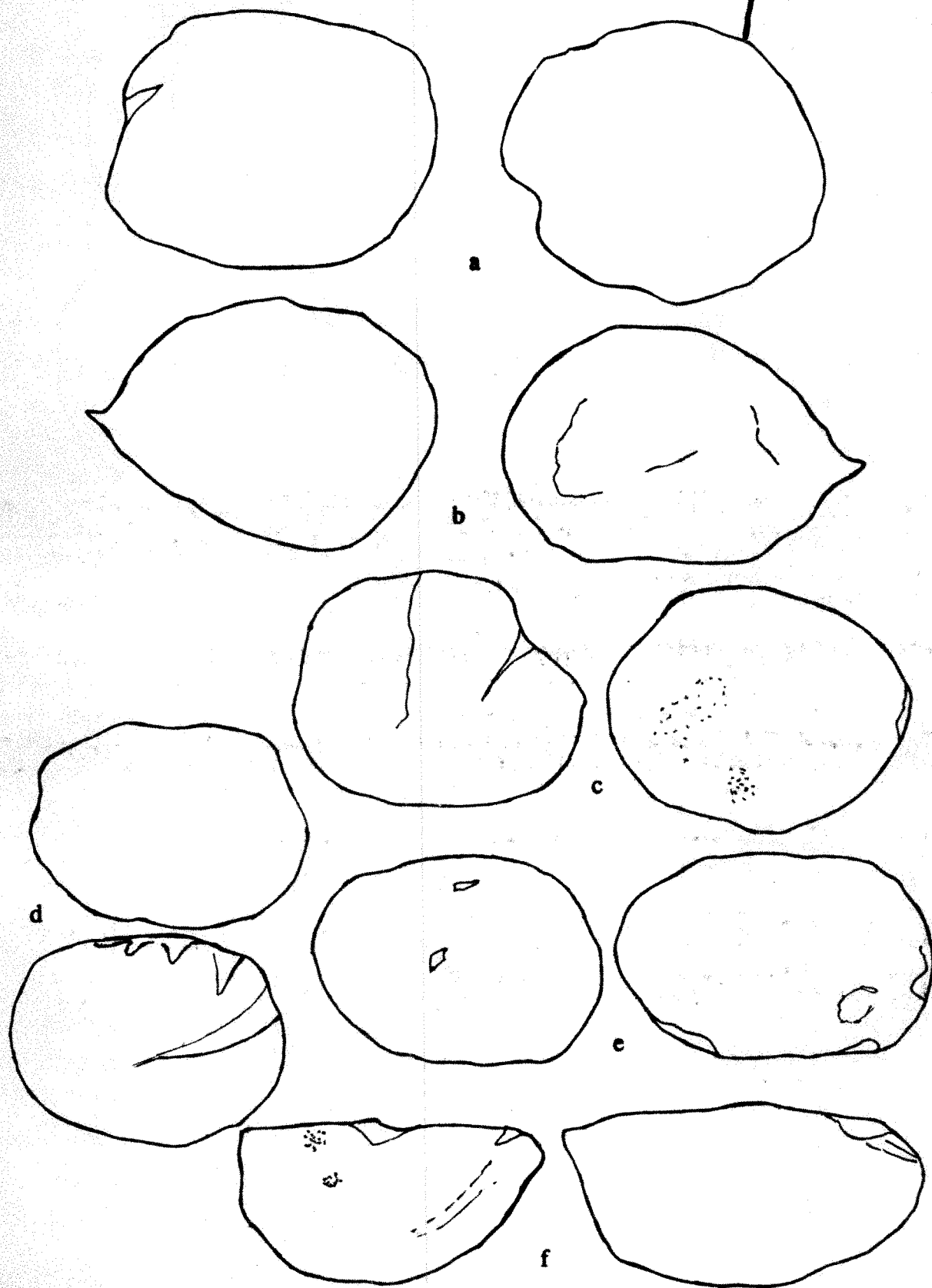


Fig. 5 (not to the scale): a. Intact grain of red gram, b. *Ablemoschus* type with stalk projection, c. Intact grain of red gram, d. and e. Intact grains of red gram, f. Broken cotyledons of red gram



Fig. 6 (not to the scale): a. and b. Red gram, c. Round seed (?), d-m Indeterminate long seeds (?)

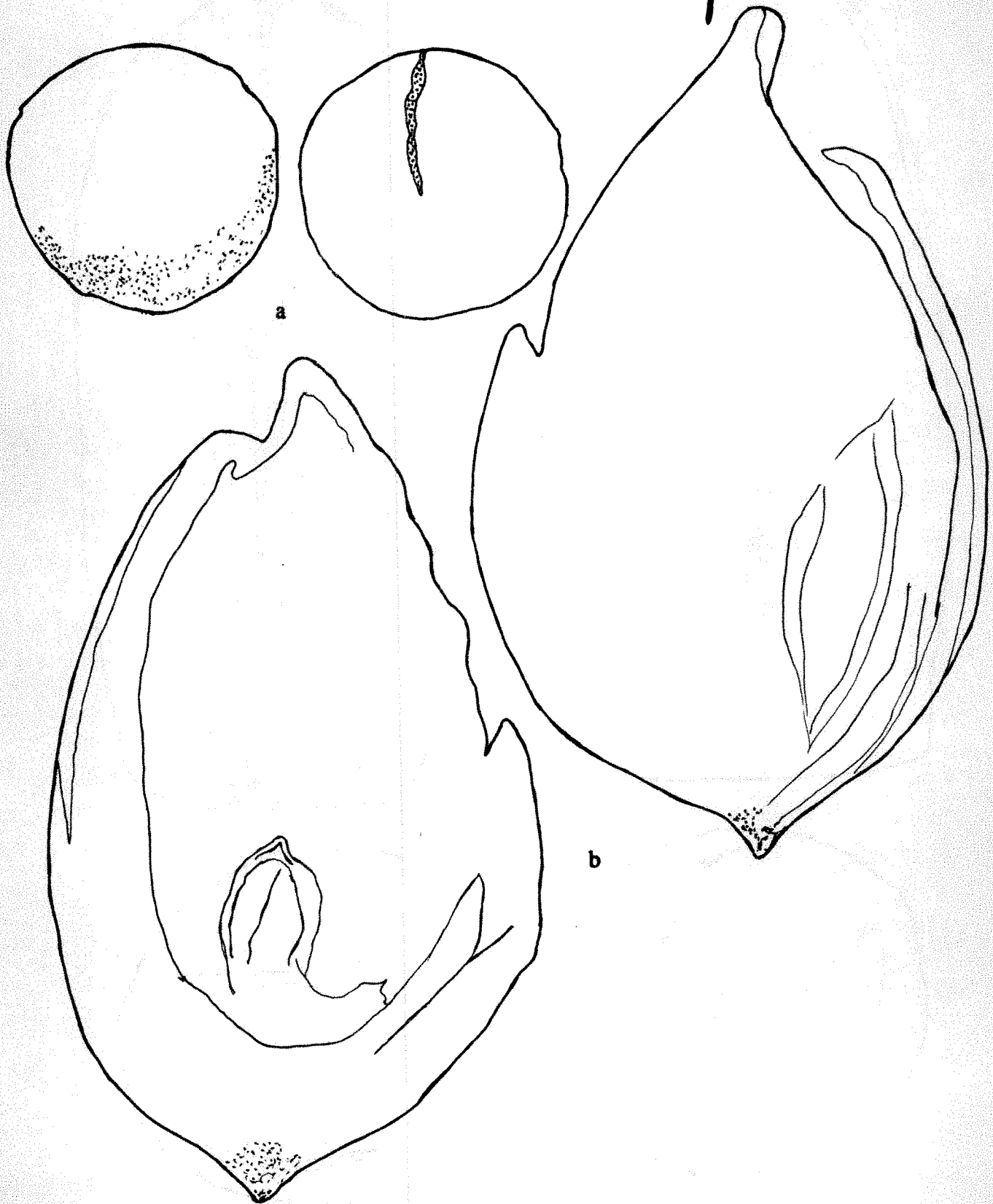


Fig. 7 (not to the scale): **a.** Round seed (?), **b.** Indeterminate seed (?)

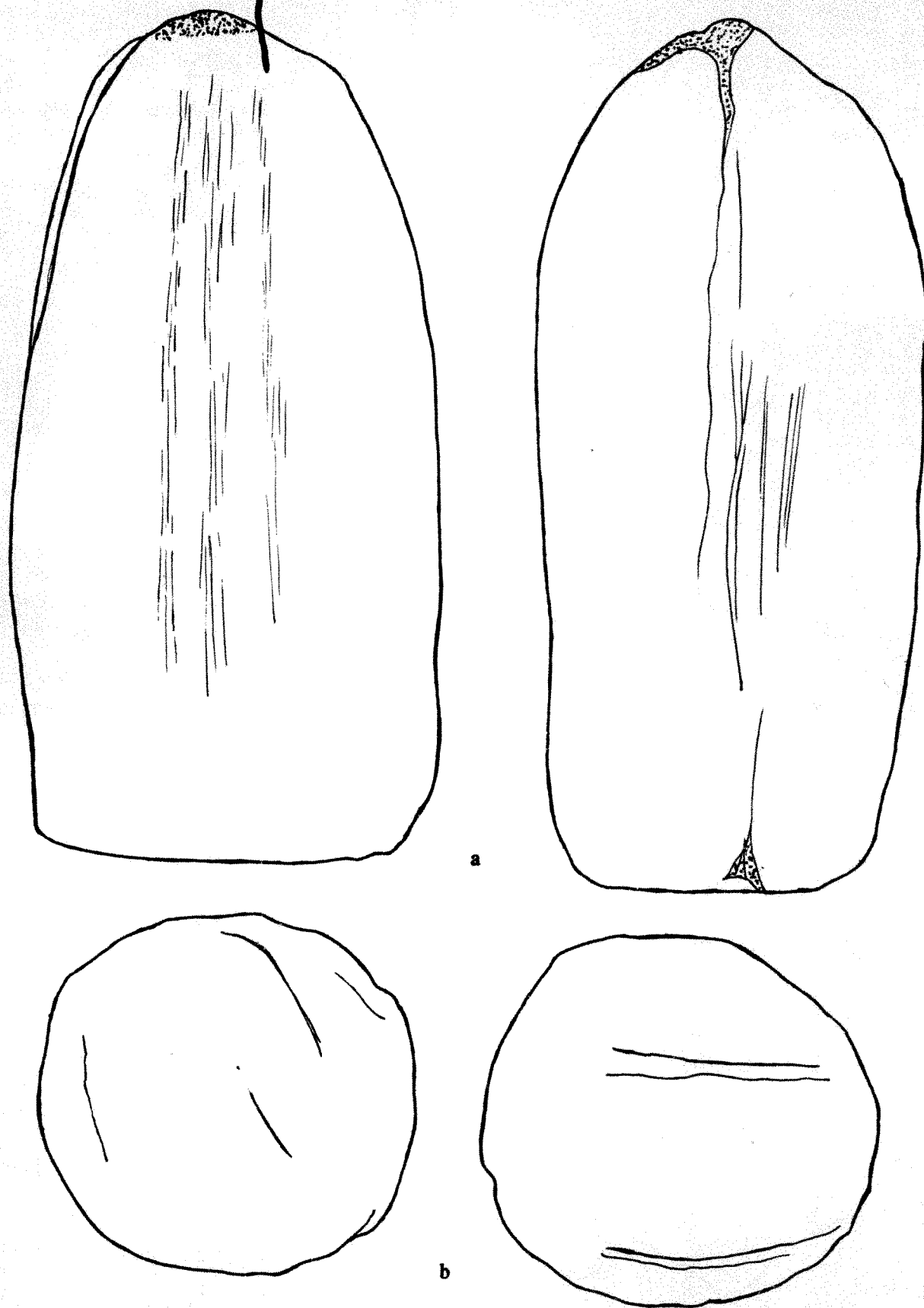


Fig. 8 (not to the scale): a. Indeterminate long seed (?), b. Round seed (?)

lithic Koppa (District Mysore, Karnatka), Kunnatur (District North Arcot, Tamil Nadu), Early Historic Arikamedu (Pondicherry) and Megalithic Adichanalur (District Tirunelveli, Tamil Nadu) have all yielded remains of rice (Kajale 1989b). Thus, the information on the plant and animal remains from the sites of Peddamudiyam and Balijapalle in the Cuddapah district of Andhra Pradesh serves as a useful addition to our knowledge of the history of plant exploitation in ancient South India.

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A Note on Megalithic Human Skeletal Remains from Kanyathirtham, Cuddapah District, Andhra Pradesh

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Abstract

Trial excavations carried out at the Megalithic site of Kanyathirtham in Cuddapah District, yielded evidence of two human skeletons, one child and one adult. The skeletal elements are extremely fragmentary and no morphometric assessment is possible. However, the adult specimen exhibits pathological lesions of exposure to fire in "flesh-on" or "green" condition on many bones. This evidence, supported by under-representation of many parts and scattered condition of bones in the sarcophagus, indicates the secondary nature of the burial. Similar evidence is reported from Vidarbha Megaliths. Some odontometric data is also reported in this article.

Introduction

The Megalithic burial site, Kanyathirtham (14° 46' N: 78° 26' E) is located 1.5 km southwest of Peddandluru village, about 15 km southeast of Jammalamadugu town in Cuddapah District, Andhra Pradesh. The third author undertook a trial excavation at the site during 1989-90 and exposed two burials, a cairn circle and a stone circle. The cairn circle was devoid of any skeletal remains. It is possible that the cairn circle was constructed to be used at a future date but was never the site of an actual burial. In the stone circle, situated 60 m to the south of the cairn circle, human skeletal remains were found. The bones had been placed in a cist located in the centre of the burial. The cist was 1.5 m long, 0.75 m broad, 1 m deep and was built of thick limestone slabs. In the cist, at a depth of 25 cm, a sarcophagus was found in which human remains had been placed and then buried. The sarcophagus was ovoid in shape with pointed corners and measured about 1 m in length, 0.5 m in width and 0.30 m in height (Fig. 1). This sarcophagus apparently contained osseous remains of two individuals, a child and an adult.

The Adult Skeleton

Though many parts of the body are represented in this collection of bones they are extremely fragmentary and no positive identification is possible for most of them.

The neurocranial vault has several small and medium-sized fragments probably of parietal, frontal and occipital

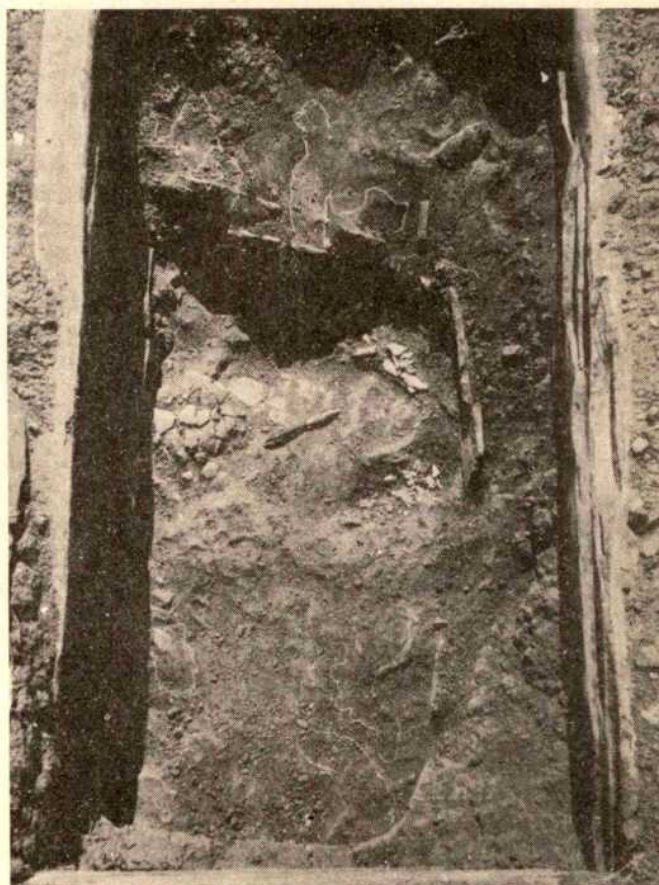


Fig. 1: Sarcophagus with osseous remains

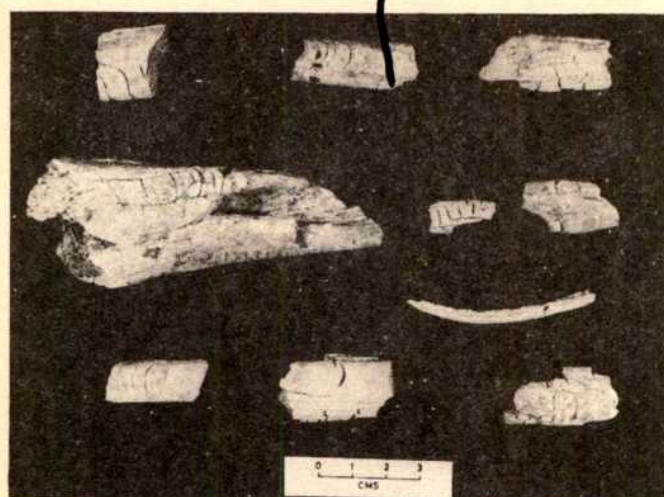


Fig. 2: Bones showing fissuring, distortion, twisting and warping

bones. The parts which could be identified with certainty include the right frontal half with temporal line, the inferior margin of the left orbit, the left and right mandibular condyles, the petrous portion of both temporals and the lamdoid portion of the occipital. No reconstruction is possible, consequently no comment on morphometry can be given.

Of the post-cranial skeleton no elements of the axial skeleton (vertebrae, ribs, etc.) are present. There is also no trace of any bone from the pelvic or pectoral girdle, except for a small fragment of the right clavicle. However, almost all the long bones, excluding metabones, are represented in the form of small- sized bone chips. Positive identification is possible only for the right proximal femur, ulna, radius, tibia and fibular mid- shaft. Like the cranial fragments the post-cranials too are beyond reconstruction.

While the specimen yielded no morphometric information, a characteristic pathological lesion is evidenced. The

elements preserved, cranial as well as post-cranial, show evidence of exposure to fire in "flesh-on" or "green" condition. Most of the bones show fissuring, distortion, twisting and warping (Fig. 2). Some of the fragments even exhibit "clean" breaks as described by Brothwell (1981: 18, Plate 1). Binford (1963) noted that the cremation of dried bones produces a different pattern to that of bones cremated with flesh around them. Burning dry bones causes cracking or "checking" on the surface and longitudinal splitting, but no warping or twisting. The burning of "green" or flesh-covered bone (as in this specimen) creates carved transverse fracture line, irregular longitudinal splitting and marked warping (quotes from Ubelaker 1989: 36). Some fragments exhibit slight shrinkage and changes in colour (black, gray or white) which suggest that the body was exposed to excessive heat (700- 900°) for a prolonged period (Van Vark 1970, requoted from Ubelaker 1989: 55).

It may be noted that the bones were found in a cist completely covered from all the sides. There is no evidence of fire detectable in the surrounding soil. In the absence of any indication of fire in the form of ash, charcoal or staining of the surrounding soil, it may be inferred that this is a fractional or secondary burial. Moreover not all parts of the body are represented. Such fractional or secondary burials in the Megalithic context have been noted at Khairwada and Raipur from the Vidarbha region (Walimbe 1988). These sites yielded skeletal evidence for exposure to fire as well as for sharp cut marks on the long bones. The Megalithic site of Dumlotti, near Karachi has also yielded evidence of calcined bones (Quamar 1983: 109). These examples of ceremonial or secondary burials may not necessarily be indicative of an intentionally evolved method for the disposal of the dead. Probably death occurred at some distant place and subsequently the available bones were collected by the kinsmen and ceremonially interred. However, the presence of a second individual in the same cist (see below) makes the

Table 1: Odontometric data

Tooth side		Crown dimensions		Crown indices		
		MD	BL	CA	CI	CM
Maxillary						
di2	L	6.27	5.44	34.11	115.26	5.86
dc	L	6.03	5.91	35.64	102.03	5.97
dm2	R	7.12	8.75	62.30	81.37	7.94
	L	7.05	8.92	62.89	79.04	7.99
M1	R	10.75	11.29	121.37	95.22	11.02
	L	10.91	11.17	121.86	97.67	11.04
M2	R	9.37	10.17	95.29	92.13	9.77
	L	9.25	10.25	94.81	90.24	9.75

interpretation more difficult. It may also be noted that at Maski (District Raichur, Karnataka), in five burials with Megalithic affiliation, traces of ash were found on the pit-floor over which the body was placed. The use of ash in this case has been interpreted as a preservative for the skeletal remains (Thapar 1957).

No positive statement is possible on the age of this individual. On the basis of the size and appearance of the long bones a young adult status may be ascribed to it. In the absence of any sexually diagnostic features, the sex of this specimen remains uncertain.

Sub-Adult Individual

The presence of sub-adult bones in the same cist is assumed on the basis of the evidence of a maxillary fragment and dentition. These bones represent an individual much younger than the one described earlier. The cranial and post-cranial remains of this individual are not easily distinguishable from the total bone assemblage from this cist because of their extremely fragmentary condition.

Both the maxillary bones, right and left, of this second individual are almost complete with many teeth still intact in their respective positions or crypts. The teeth present include Ldi2, LI1 (in crypt), Ldc, Ldm2, LM1, LM2 (germ); RC (germ), Rdm2, RM1 and RM2 (germ). Grade 4-hypocone (Dahlberg 1949 standard) is seen on the first permanent molars. The odontometric data is given in Table 1. Metric observations follow the methods recommended by Moorrees (1957).

The deciduous second incisor, canine and second molars were still in use at the time of death. The first permanent molar had erupted which indicates an age around seven years. The permanent canine and second molars have nearly completed crown calcification, a status usually achieved around 7-8 years (Schour and Massler 1940). On this basis it can be concluded that the child was around seven years at the time of death. Not many sub-adult burials

are reported in the Megalithic context. Sharing of the same burial and the same sarcophagus by two individuals, a child and an adult is enigmatic. No genetic relationship could be established between them for want of adequate evidence. However, it is highly probable that the two individuals belonged to one family.

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Archaeology in France: Structure and New Trends

Interview with Dr. Françoise Audouze

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by

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Dr. Françoise Audouze, Director of Research at the CNRS (National Centre for Scientific Research), Paris and Director of the Centre for Archaeological Research, the principal laboratory for archaeology in France, visited Deccan College Post-Graduate & Research Institute from 20th to 24th January, 1991. Dr. Audouze's research interests encompass the period from the Upper Palaeolithic to the Iron Age, particularly settlement analysis, palaeoethnological interpretation, spatial organisation, procurement strategies, seasonality among hunter-gatherers, microwear analysis, experimental archaeology, taphonomy, and ethnoarchaeology. She has studied Bronze Age ornaments, the transition from village to cities in Celtic Europe, carried out an ethnoarchaeological study in Baluchistan jointly with Catherine Jarrige, and is currently excavating an Upper Palaeolithic reindeer hunters' camp in north France, and an Iron Age Hill fort. As Director of the main archaeological laboratory in France and Vice-Chairperson of the National Council for Archaeology she is involved in the formulation of policy for archaeological research in France. Dr. Audouze's publications include a large number of articles in scientific journals, and a book *Countryside, Villages and Cities of Celtic Europe* written jointly with Dr. Olivier Buchsenschutz. She is also one of the editors of the Newsletter *Les Nouvelles de l'Archéologie*, and has recently edited, with Dr. André Tchernia, a special issue of *Le Courrier du CNRS* on *New Trends in French Archaeology*.

During her visit to Deccan College, Dr. Audouze delivered two lectures: (1) *Archaeology in France: Structure and New Trends*, and (2) *Hunter-Gatherers of the Upper Palaeolithic: A Multidisciplinary Approach*. Considering the fact that Prehistory as a scientific discipline was born in France and it continues to enjoy a high priority in research in that country, Dr. Audouze's lectures evoked wide interest. Dr. Audouze was interviewed by me during her visit. The interview is being published in the hope that the readers of

Man and Environment will get a general picture of contemporary archaeological, specially prehistoric, research in France.

V.N. Misra (VNM): Dr. Audouze, would you give us a general picture of the structure of archaeological research in France?

Françoise Audouze (FA): The structure of archaeological research in France is a complex one. Archaeology in France has a history of several centuries. It began when educated aristocrats and bishops became interested in collecting 'Antiques' and Prehistoric axes for their 'cabinets' during the 16th and 17th centuries. It has developed from different branches of knowledge: Classical Archaeology originated in Classical Studies with strong links with epigraphy; Near Eastern archaeology emerged from Biblical studies, while Prehistory grew as a branch of the Natural Sciences and of Geology. In the beginning archaeological studies were not introduced in universities, but developed in Museums of Natural History and in the Collège de France. The latter institution, specially created in the 16th century to teach disciplines not recognized by the universities, also developed Near Eastern Studies along with the History of Religions. Prior to the middle of the twentieth century, only Classical Archaeology was taught in universities.

VNM: Approximately how many institutions and individuals are actively involved in archaeological research in France?

FA: Many institutions are actively involved in archaeological research in France. Some are more oriented towards fundamental research, while others are more oriented towards an inventory and preservation of the archaeological heritage.

1. **Sous-Direction de l'Archéologie** (The Deputy Directorate of Archaeology) is a branch of the **Direction du Patrimoine** (Directorate of Heritage) in the Ministry of Culture. It is equivalent to the Archaeological Survey of India. It is in charge of conducting surveys, research and rescue excavations, of controlling excavations by other institutions and amateurs, and also in setting up the 'Carte Archéologique' — a general inventory of archaeological finds soon to be extended to the evaluation of areas of potential interest for archaeology. About 300 researchers and technicians work in the central service in Paris and in the twenty regional **Directions des Antiquités** (Directorates of Antiquities)
 2. About a dozen universities offer a complete course in Archaeology or in Prehistory. Ten more offer archaeology courses within the Departments of History or Classical Studies. The University of Paris I is reputed for its Greek and Near Eastern Archaeology, and for Prehistory; the Universities of Paris IV and Aix for Greek and Roman Archaeology, the University of Lyon for Greek and Near Eastern Studies, the Universities of Aix and Tours for Medieval and Urban Archaeology, and the University of Paris X and Bordeaux for Prehistory. Only Paris I, Paris X and Bordeaux lay strong emphasis on palaeoenvironment and archaeometry. Graduate students are actively involved in the projects and excavations organized by their teachers. There are about 300 to 400 academics and several hundred students.
 3. The CNRS is the only institution of its kind in the world since it is not only a funding agency like the NSF (National Science Foundation) of the U.S.A., but it also includes a body of around 11000 researchers and 11000 technicians and administrators who work in all fields from Mathematics and Engineering Sciences to Biology, and Human and Social Sciences. Around 300 researchers and 240 technicians are engaged in archaeology, half of them working abroad, mainly in the Mediterranean countries, in the Near and Middle East as well as in Meso-America and the Pacific Islands. The CNRS provides funding for its own archaeology laboratories as well as for the university laboratories. Researchers and academics may work in any of the two categories of laboratories, according to their areas of interest or specialization.
 4. Regional, departmental and city archaeological units constitute developing agencies since Regional, Departmental and City Councils are getting more and more interested in the preservation of their cultural heritage. These units employ one to ten archaeologists (researchers and technicians) and presently they have a strength of around one hundred and fifty personnel.
 5. Museums have played an important role in the development of Archaeology and Prehistory since the 19th century. Today, around one hundred curators are engaged in archaeological research. The Musée du Louvre and Musée des Antiquités Nationales are prestigious institutions for archaeology; the former for Classical and Oriental archaeology and the latter for Prehistory.
 6. Amateurs have been the main support in the development of Prehistory during the 19th century and the first half of the 20th century. They still constitute a large body of people though it is difficult to assess their number. However, it can be said that they obtain around 20% of the excavation permits and number several hundred people, though not all of them conduct excavations at the same time. They are usually associated with one or more archaeological societies. The most prestigious of them, La Société Préhistorique Française, includes both amateurs and professionals. It has around 3000 members, of whom about 800 are foreign archaeologists.
 7. A new body of field archaeologists has appeared in the last decade. It consists of around 700 contract field archaeologists, only 250 of whom are well-trained and experienced scholars. Up to now, they were recruited on a regional basis, on short term contracts (three months to one year). A para-public agency is currently under creation which will be dedicated to rescue archaeology. Around 250 of the best contract diggers will be recruited by this agency on long-term contracts. As a whole, there are probably around one thousand positions for professional archaeologists.
- VNM: Could you give a general picture of the funds spent on archaeological research?
- FA: More than 240 million Francs (around Rupees 90 crores) were spent on archaeology in France in 1990. This figure does not include the funds for teaching archaeology in universities, nor the salaries of permanent employees, but it does include the cost of contracts.
- Around 40 million Francs come from the Ministry of Foreign Affairs for French Archaeological Missions abroad, for the French Institutes overseas (among which are the prestigious Écoles d'Athènes, de Rome and d'Extrême-Orient, and the French Institute at Pondichery) and for permanent French Centres (such as the Centre for Human Sciences in New Delhi).
- The CNRS budget includes 12 million Francs for fundamental research in archaeology, archaeometry and palaeoenvironment. It does not provide funding for field work which comes either from the Ministry of Foreign Affairs or the Ministry of Culture.

It is very difficult to evaluate how much money for research is contributed by the universities, but it is certainly well below one million Francs.

Some 35 million Francs are spent by the Ministry of Culture for fundamental research excavations, rescue excavations, for publication, systematic survey, and for the general requirements of the central and regional services (archaeometric and paleoenvironmental analysis, dating, and restoration of artefacts). In 1991, 17 million Francs will be added for the 'Carte Archéologique', a systematic inventory, not only of archaeological finds and sites, but also of the archaeological potential of soils — an ambitious project, but absolutely necessary to control the rapid destruction of archaeological sites.

Around 165 million Francs come from public and private developers whose projects (motorways, railroads, buildings, industrial plants or parking lots) will destroy archaeological sites. This includes both private companies and Regional, Departmental and City Councils which act as developers.

Regional and Departmental Councils subsidise rescue archaeology and even professional research, but the amount of subsidy varies considerably from one region to another, and is usually given directly to individuals on the basis of approved projects. The total amount probably exceeds one million Francs.

Among museums, only the Musée du Louvre is rich enough to provide its researchers a few grants for carrying out excavations abroad.

VNM: How much of this money comes from the State and how much from private sources?

FA: The present situation is completely different from what it was a decade ago. In 1982, the Minister of Culture, Jack Lang, succeeded in persuading the parliament to pass a very important law which gives the regional Directors of Antiquities, under the responsibility of the regional representative of the government (the 'Préfet= Prefect') the power to suspend or forbid any public or private works which are likely to destroy archaeological sites. Though the law does not specify who must pay for the excavations if the developers are allowed to implement their projects, agreements are made between the regional Directors of Antiquities and the developers so that the latter often pay for the preliminary investigations, the excavation and the post-excavation studies. Only small companies or poor cities or villages are allowed to get up to 50% of their expenses from public funds. That is why the funds controlled by the Sous-Direction de l'Archéologie have increased ten-fold in nine years (from 20 to 200 million Francs).

Meanwhile, public funds for archaeological research have only been doubled. The funds contributed by regional and other territorial authorities are also increasing, but they constitute only a part of the 165 million Francs provided by developers.

This is of course a great opportunity for French archaeology but it has its drawbacks. One of them is that all this money goes into rescue archaeology, and research excavations are not benefitting from it. French archaeologists may have to make a choice between problem-oriented research with poorly funded excavations, and rescue archaeology with ample funds, but without scientific research strategies. The rescue excavation budget is quite different from the research excavation budget in the Ministry of Culture, and the latter is, of course, much smaller (7 million Francs in 1990).

The other major problem is that substantial finances are not always set aside for the most important sites, but for the sites that are threatened with destruction by important or rich developers for whom the archaeological expenses fall within the risk margin, and are, therefore, affordable.

The next improvement in French regulations should include two steps. The first would be to define the financial responsibilities of the developers and of the State (for example, publication beyond the preliminary report could be the responsibility of the State). The second and more important step would be to collect all the developers' money within one source of funding which could then be utilized according to genuine scientific needs. The introduction of a public or para-public tax would have the advantage of centralizing the collection and redistribution of this money, and would equalize the risks for the developers. Unfortunately, the present national budget policy in France aims to reduce taxation. Consequently, the proposition outlined above, though introduced by the Minister of Culture, has been rejected. For the next few years the Sous-Direction de l'Archéologie will be obliged to go on negotiating agreements case by case. As a result, the rescue funds vary according to the volume of public and private development, the latter being totally out of public control. Thus, the amount of money invested in rescue archaeology cannot be defined nor controlled by parliament through the public budget. The number of contract field archaeologists constantly varies (and, at present is increasing very fast), thus preventing adequate control over their professional expertise. Rescue archaeology could come to a sudden stop in case of a financial crisis that may lead to a reduction in or stoppage of development work.

VNM: I took part in Prof. François Bordes' excavation at Pech-de-l'Azé in 1970 and also visited Prof. Henry de Lumley's excavations at Lazaret and Tautavel in 1970 and 1976. I have also participated in excavations undertaken by several other archaeologists. One thing that struck me was that, unlike in India where we employ a large number of paid labourers, all manual work at these excavations was done by archaeologists, including student trainees and amateurs. Why is this so? Is it because labour is expensive or because you have an adequate number of students and amateurs?

FA: This situation is, first, a legacy of the period when all field work was conducted privately, even by professionals and without public aid. Gradually, small grants were allocated with excavation permits, but this was only to pay for food and housing, not wages to diggers. In view of this, the French archaeologists used to rely on students and amateurs to help them. Even now, when research excavations as well as rescue excavations are better funded, the budgets of research projects do not include wages for local help.

Another very important factor is the importance given in France to refined digging techniques. Though fine control on stratigraphy is considered essential, the goal of most excavations is the horizontal exposure of living floors. The eminent prehistorian Prof. André Leroi-Gourhan was instrumental in developing excavation techniques, mapping and vertical photography in order to create detailed and objective archives of the past. Paid workers are needed only for the excavation of large Roman sites with architecture, or for urban sites, and for short-term but large-scale excavations abroad.

Of course, with the exponential development of rescue excavations which must be performed on a large scale in a very short time, the situation has changed. There is enough money to pay wages, and task forces are hired along with field archaeologists for these programmes, but the number of trained archaeologists in these crews remains comparatively high or very high. However, during the excavation of prehistoric sites, few or no workers are employed. Briefly, one could say that picks and shovels can be put in workers' hands but not trowels and dentist's tools. It must also be said that up to now there was no money to create a task-force of trained workers of the type who are employed in the Near East and in India. With the development of salvage archaeology, however, such a category of specialized diggers is emerging.

VNM: What role do amateurs play in archaeological research in France?

FA: The role of amateurs has been instrumental in the development of Prehistory. The most famous prehistorians of the 19th century were amateurs. For example, Boucher de Perthes was a civil servant, Salomon Reinach and Paul de Mortillet, before becoming curators of the Musée de l'Antiquités Nationales, were rich amateurs. The Abbé Breuil was a priest who achieved such wide recognition that he was elected the first Professor of Prehistory in the Collège de France, and he was the first to introduce Prehistory at the university level. Amateurs played a minor role in the development of Classical Archaeology, but they still play an important role in French archaeology. Around 20% of the rescue excavation permits are given to amateurs. But one should not get confused on account of this rough estimate because it usually concerns small-scale rescue excavations. The present policy in French archaeology is to discourage people from carrying out very small-scale excavations and to reduce the number of research excavations, to the advantage of large multidisciplinary projects. Week-end excavations are no longer funded and all such applications are rejected. This means that many amateurs cannot adapt to this new situation and their role in French archaeology is decreasing. Lastly, the recruitment of hundreds of contract archaeologists has turned a lot of young amateurs into professionals.

VNM: On what basis are excavation permits issued in France?

FA: People who want to conduct an excavation submit a project proposal providing information about the importance of the site, the problems of research, the names of the specialists who are concerned with dating, palaeoenvironmental analysis, and, if necessary, archaeometry. Their curriculum vitae and publications must show their competence to conduct the digs, analyse the finds, and publish the results of the excavation. A detailed budget estimate, including the costs of analyses and dating, has to be incorporated in the project proposal. The investigator must also indicate where the finds will be deposited (museums or storage buildings of the Sous-Direction de l'Archéologie). Lastly, they must provide written authorisation from the land owner saying that he does not object to excavations on his land, and is agreeable to the permanent or temporary deposition of the finds with the State authorities since, by law, the artefacts are his property.

In the present, highly centralized organisation of the Service of Archaeology, the first stage of work entails a review of the proposal by the Director of the Region where the excavation is to take place. The second stage involves a review by a member of the Conseil National Supérieur de l'Archéologie (High

National Council for Archaeology) which is in charge of giving advice on the issue of permits. After the Council approves the proposal, the permit is issued by the Sous-Directeur de l'Archéologie, and a grant is awarded to the archaeologist provided he undertakes to submit an annual report and to publish the full results after the completion of the project.

Four years ago, because of the increasing number of proposals submitted for review, a three-year permit was introduced with the condition that the excavator would submit short interim reports annually and a comprehensive one after the completion of the excavation. The latter has to be prepared in the form of a draft which is suitable for publication.

In the new decentralized organization of the Service (starting in 1991), projects will be reviewed at the regional level by a regional delegation of the Conseil Supérieur and the decision regarding permits will be taken by the Regional Director of Antiquities.

In case of an emergency rescue excavation, the Regional Director of Antiquities is entitled to organise the salvage operations on his own and to proceed with the work. Later, an a posteriori evaluation is conducted by the Conseil Supérieur.

During the last two years, there have been so many rescue proposals for review (around 20 to 40 per month) that the bureau of the Conseil Supérieur which is supposed to meet once a month has not been able to work in a satisfactory manner. It has therefore been decided to give up a priori reviews and to entrust the whole review and decision process to the Regional Directors of Antiquities. Detailed a posteriori reviews and evaluations will be conducted by the members of the Conseil Supérieur with implications for further excavation permits and grants.

VNM: The popular impression of archaeology is that it is a field science, that archaeologists excavate ancient sites, make exciting finds and report them. But during the last three decades, the role of laboratory research has become increasingly important in reconstructing past life patterns and environments. A large number of sciences like geology, sedimentology, pedology, palaeontology, archaeozoology, botany, chemistry and physics are now contributing to the extraction of vital information from primary archaeological data. Since you are in charge of the main CNRS laboratory, would you tell us the position of laboratory research in respect of archaeology in France?

FA: In France, as in other countries, the importance given to archaeological research in the laboratory is increasing. It is no longer conceivable to undertake an excavation merely to retrieve artefacts and beautiful objects. What is sought is the reconstruction of the

past, the history of the people, not only through their artefacts and buildings but also through the way they shaped and exploited the landscape, plants, animals, and mineral resources. Yet another major goal is to reconstruct the economic and social organisation that prevailed in the past.

In France right now we have several laboratories that are specially equipped for palaeobotanical studies. Three of them are meant exclusively for archaeological material. In addition, three laboratories specialise in archaeozoology, and several others in palaeontology. Sedimentology is carried out in many laboratories, specially in François Bordes' in Bordeaux. Two laboratories have specialized in the chemical and physical analysis of ceramics, two in ¹⁴C dating, two in TL dating, and one in neutron activation. Archaeologists also seek cooperation from individual scientists associated with different laboratories.

VNM: What are the new trends in archaeological research in France?

FA: French Archaeology is developing a specific multidisciplinary approach in which much attention is paid to human action on nature. We are not so much interested in reconstructing the climate or environment as in understanding the ecological interaction between man and the environment, the modifications in the environment caused by man's selection of vegetal and animal species or breeds. Palaeopedology and micromorphology are beginning to be extensively used for reconstructing anthropic actions through the study of the alterations and transformations of soils.

Another research trend initiated by André Leroi-Gourhan is in ethnology. The reconstruction of ancient technologies has become a very important branch of French Prehistory. Using bone and stone in experimentation, microwear analysis, and in the identification of raw as well as transformed materials, it is possible to reconstruct fairly accurately prehistoric resource procurement strategies and resource management. Analysis of the variability among settlement units allows us to gain a deeper insight into the social and economic choices and constraints that operated in the past. It also helps us to avoid the 'abusive generalization' of information (giving clues about collective trends but not about the individuals) that post-processualists so strongly condemn. The study of variability, particularly through technological analysis, may, in several cases, help to identify individual activities. In several Upper Palaeolithic settlements it has been possible to identify several 'hands', and to recognise several levels of knapping competence starting at an apprentice level with many

mistakes resulting in the abandonment of wasted flint cores.

The third important developing trend is the shift from site studies to micro-regional or regional research. In these studies an effort is made to reconstruct geomorphic features and the changes in the settlement organisation in relation to ecology and variations in the resource procurement strategies. A drastic change has taken place in sedimentological and palaeoenvironmental analyses. Archaeologists have come to realise that samples collected within a settlement reflect mostly human and animal activities. A lot more attention is now being paid to systematic sampling away from sites, particularly in lakes and peat bogs which preserve very well developed stratified 'archives' of past vegetation. Comparisons with intra-site samples give information about man's selective action on his environment. For historical periods, this is combined with the analysis of aerial photographs and remote sensing data in order to reconstruct agricultural practices and the alignment of fields. At the same time, French archaeologists are very keen to maintain their high standard of excavation techniques.

VNM: What has been the impact on French Archaeology of the New Archaeology movement, initiated by David Clarke and Lewis Binford?

FA: The first impact was a rather violent one. Younger archaeologists were enthusiastic while senior archaeologists strongly opposed it. The main reaction was not so much to the theoretical part as to the applications which were supposed to support the new ideas and were often made with reference to archaeological data of dubious value. As a result, the French being the good empiricists that they are, could not accept this.

The heated argument between François Bordes and Lewis Binford about the variability in Mousterian facies gives a good idea of the intellectual debate. But New Archaeology, even when it was partly or totally opposed, was always considered a challenge to be confronted and overcome.

Since archaeological theory is not taught in French universities, the Department of Archaeology of the University of Paris I has every year since 1978 been inviting a foreign theoretician to teach there for six months. The visiting scholars have included R. Whallon and the post-processualists Ian Hodder and M. Rowlands.

Post-processualism did not interest the French archaeologists very much for the simple reason that, since Leroi-Gourhan, they had always approached their problems from a contextual point of view and a

large part of the debate initiated by Ian Hodder seemed pointless to them.

Today, French archaeology has reached a kind of compromise between theoretical approaches and empirical approaches. There is a greater use of ecological, economic and sociological models, but they are introduced at a later stage of research, once the range of hypotheses has been reduced to a particular context.

VNM: In the context of growing industrialisation and developmental activities everywhere a lot of modification of the land surface takes place. Naturally this leads to the discovery, and the eventual destruction of archaeological sites. Many countries, both capitalist and socialist, have made laws for salvage or rescue archaeology. Could you enlighten us about the situation in your country?

FA: In 1982, a law was passed which authorises the Regional Directors of Antiquities to suspend or prohibit public or private works which would destroy an archaeological site. Every development programme must be submitted to the Regional Director to obtain clearance for its execution.

Since development is inevitable, permits for destroying archaeological sites are given provided the developers pay for the expenses of rescue excavations from survey to publication. As a result, not only the number but also the scale of rescue excavations has completely changed. There are between 200 and 300 rescue excavations every year, a dozen of them requiring crews of more than 20 people for over one year.

The last but most crucial problem is the limited time given to the contract archaeologists to publish their findings. The excavation of a site often takes longer than expected and the contract archaeologist gets very little time or no time at all to complete the publication of the results. Many rescue excavations are only known by preliminary reports, which are sometimes of poor quality. This is a problem that the United States experienced fifteen years ago when it started organising its Current Resource Management programme.

VNM: Could you please cite some important examples of Rescue Archaeology in your country?

FA: I can give two examples: one is the excavation of the 'Cour Napoléon' in the middle of the Musée du Louvre for which one hundred diggers were hired for four years. It was the first project undertaken on such a scale. It resulted in exposing a whole medieval quarter of the city of Paris, in which gardens and orchards were included in the architectural features. It also uncovered the foundations of a hitherto unknown

first stage of the Tuileries Palace facing the Louvre Palace. But since it was the first project of this size, a problem arose with regard to the storage of the thousands of artefacts in a place where they could be properly studied. Moreover, it has also been difficult to complete the publication.

Having learnt from this first experience, recent projects have been more carefully designed. In the last two years, the construction of the TGV (Super Fast Train) railroad from Paris to Brussels has resulted in the largest rescue programme undertaken so far. The railroad is going to destroy a strip of land 300 km long and 80 m wide. The railroad company agreed to pay the expenses of the archaeological rescue operation, i.e. 60 million Francs. Twenty people were hired for the survey and diagnostic phase, and the project led to the discovery of as many as 160 sites among which 90 were selected for excavation. One hundred and fifty diggers and field archaeologists were hired for 18 months. Twelve of the 90 sites proved to be of national importance; these included an Acheulian and a Mousterian site of a richness unknown since the work of Boucher de Perthes, a Neolithic mine comprising hundreds of mine shafts and galleries, a Gallo-Roman villa and a vicus (Gallo village). Two early medieval villages, seldom found because of their elusive nature, were also located. Fifty people now remain under contract for one more year to do the post-excavation work and to write the report.

VNM: We all know that Prehistory as a scientific discipline was born in France in the early part of the last century. It was the discovery, made by Boucher de Perthes, of stone tools and fossilized animal bones in geological deposits which ultimately led to the acceptance of the idea that man has an antiquity going back into the Stone Age. La Préhistoire or Prehistory is a word known to every educated person in France. There is hardly any other country where Prehistory is such a popular subject. Would you comment on the position of prehistoric research vis-a-vis later archaeological research in general in your country?

FA: For years, Prehistory has experienced a completely separate development from Classical Archaeology, the former being related to the natural sciences and anthropology, the latter associated with epigraphy and history. Today, in spite of some mutual distrust still present among a few old-fashioned archaeologists, there is a strong trend towards the unification of archaeology as one discipline and the recognition of problems that are common to all periods and geographical areas. In the sixties, medieval archaeologists working on rural sites had already understood

the basic similarities existing between their techniques and approaches and those used in Prehistoric Archaeology. The interest in theory and in landscape study has been another step which has brought the younger Classicists and Prehistorians to a better understanding of mutual problems. Archaeology is organised within the CNRS in four sections, namely Oriental Studies, Classical Studies, History, and Anthropology as is the case in many universities. But there has been a strong movement among the CNRS researchers to change this situation and bring all the archaeologists within one section. However, the opposition of senior Classicists and the fact that their discipline constitutes too large a section, has resulted in the creation of two sections: one for that period of archaeology without writing (Prehistory), and the other for historical archaeology.

A newsletter, *Les Nouvelles de l'Archéologie* created in 1979 by a group of young archaeologists has been instrumental in aiding this unification by the systematic publication of scientific news of general interest to all archaeologists in addition to publishing special issues on new approaches and methods.

VNM: How do you compare the place of archaeology in France with that in other European countries?

FA: French archaeology has certainly reached international standards. It is not everywhere of the same quality but in all fields there are people of international reputation. Our standards of excavation are very high. Our weak point is theory; we use it but do not contribute to its development. However, some French archaeologists are now formulating an intermediate level of theories about the social structure of Neolithic and protohistoric societies based on original archaeological data.

As regards funding, France is in a much better position financially than certain other European countries, for example, the United Kingdom where money, for archaeology and generally for all research, has been severely curtailed. If we face a sort of crisis it is a good one caused by accelerated growth.

VNM: What is the position of women in archaeology in France?

FA: France provides favourable research conditions for women. Women comprise around 30% of the personnel in the CNRS, and probably the same percentage in the universities and in the Sous-Direction de l'Archéologie. But, as everywhere, complete equality does not exist and fewer top positions are held by women.

VNM: What place does archaeology find in the French press and in the electronic media?

FA: As with most scientific subjects outside medical and space research, archaeology gets a fairly decent coverage in the press, specially in leading newspapers, but almost none in the tabloid press and in the electronic media. More papers are published in summer both because it is the field season and because there are fewer political events to report. This also means that the image of archaeology, which is still projected by the popular press, is an image of discovery and not of an analytical and multidisciplinary science. Recently, a journalist found it amusing to picture an archaeologist on the top of the barrow he was excavating wearing a hat in the style of Indiana Jones.

Two years ago, the Ministry of Research became quite concerned about the image of science in the electronic media and asked a scientist to write a report and to make recommendations to improve the situation. But so far we have not seen any real change. There used to be a scientific series on one TV channel but since private channels have been introduced the general cultural level of French TV has deteriorated and this unique series has been stopped. Archaeology, however, was hardly ever mentioned on it.

VNM: What are the major scientific and popular archaeological journals in France?

FA: Scientific papers in French archaeology are distributed in numerous specialised journals. For Prehistory, the best journals are *Gallia Préhistoire*, *Bulletin de la Société Préhistorique Française*, and *L'Anthropologie*. For Oriental Archaeology, there is one journal of international reputation: *Paleorient*, for Classical Studies *L'Archéologie* and the *Bulletins of the Schools of Athens and Rome*. For the medieval period *Archéologie Médiévale* is the main journal. There is also a *Journal de la Société des Américanistes*, a

Journal de la Société des Océanistes and a *Journal de la Société des Africanistes*. Besides these national publications, the Sous-Direction de l'Archéologie has encouraged, during the last decade, regional publications, either covering all periods or specialising in Prehistory or in the later periods. This scheme is not really a success in spite of the important subsidies given by the Ministry of Culture and the CNRS. The multiplication of journals has reduced the potential number of readers per region. Moreover their prices are too high for students.

I am convinced that we now have to move to a different level of publication and that we must create one or several European journals with international editorial boards.

Among the scientific journals, *Les Nouvelles de l'Archéologie* should also be mentioned as it is a unique newsletter dedicated not only to scientific news in France, but also to archaeological policy in France and abroad.

The best popular, scientific journal in France is *LA RECHERCHE* which is the French equivalent of *Scientific American* and which caters to the educated public. There are also very good archaeological papers in a journal called *Science et Avenir* which is accessible to a larger public. In *La Recherche*, papers are written by scientists and edited by the journal editors; in *Science et Avenir*, the papers are written by journalists. *Scientific American*, which is published in a French version under the title *Pour la Science*, carries some papers specially written for the French issues.

There is also a monthly journal entirely dedicated to archaeology called *Archéologia* which is reputed for the quality of its colour pictures.

VNM: Thank you Dr. Audouze very much.

Book Review

Excavations at Kaothe by M.K. Dhavalikar, Vasant Shinde and Shubhangana Atre. Deccan College Post-Graduate and Research Institute, Pune, 1990, Pages 283, Price Rs. 350/-

The excavations undertaken by M.K. Dhavalikar and his colleagues at Kaothe attempt to trace the life pattern of the "first farmers of Maharashtra" in a way that should serve as a model for the excavation of such sites in India. The precision in gathering the evidence and the use of varied techniques including, site catchment analysis has resulted in a very comprehensive study. Sites like Kaothe are spread over extensive areas but have only a thin accumulation of sediment, thus posing problems for the excavators as they lack elaborate stratigraphical sections. As a result, chronological evaluation has to be based on data from limited vertical stratigraphy. This is more than compensated for if the finds are precisely recorded on the horizontal plane as has been done at Kaothe.

The Savalda Culture to which Kaothe belongs, was first identified by S.A. Sali (former Superintending Archaeologist, Archaeological Survey of India) at Daimabad underlying what he believed to be the Late Harappan horizon. However, doubts have been expressed on this score and one cannot help but recall the controversy of the early eighties over the so-called Harappan bronzes from Daimabad. Even Kaothe was initially believed to be a Late Harappan settlement. Probably the misunderstanding is caused by some superficial similarities between the Harappan and Savalda ceramics. Though the Savalda pottery is painted black on a red surface, its range of shapes is limited. One of the diagnostic types is a kind of *lota* that occurs at Rangpur and more recently discovered at Babarkot in Saurashtra. Even the decoration has a few identical motifs, suggesting contact between the two cultures. However, there is a marked difference in the range of faunal motifs which reflect an extraordinarily varied animal life. The Kaothe farmers were closely attached to their immediate environment and this is reflected in their paintings.

The excavations unearthed a number of closely spaced circular pit-dwellings. The Kaothe settlers led a nomadic

existence and only occupied the site temporarily during the monsoon. This explains their building flimsy pit-dwellings. The tradition of circular huts seems to be widespread in western India during Chalcolithic times. Apart from the Neolithic-Chalcolithic settlements of Inamgaon in Maharashtra, circular houses were also unearthed from the Late Harappan site of Vagad in Saurashtra. It is quite possible that these dwellings were sometimes meant to be occupied for a longer duration, though this is not the case at Kaothe. The seasonal occupation of the site was limited to the monsoon months although in support of this argument evidence cited is of a rather dubious kind.

The occurrence of bajra, *Pennisetum* has been recorded at Kaothe, yet its stratigraphical context is not well ascertained. Had the evidence been specific, the Kaothe *Pennisetum* would have been the earliest found in India apart from Rangpur. There is already a great deal of thinking on the theory that bajra originated in Africa. In Kutch and Saurashtra folklore states that it is an import from Africa.

On the basis of faunal remains, P.K. Thomas also suggests that Kaothe was occupied between the months of July and September. These conclusions are borne out by evidence from the Lustrous Red Ware site at Oriyo in Saurashtra where Paul Rissman suggested transhumance during the monsoon. His theory is based on the study of animal dentition. During the monsoon grass grows profusely at this site and is consumed in large quantities by the ungulates and is then reflected in their dentition.

A significant fact at Kaothe is the dependence on animal food which also accounts for the lack of any considerable evidence of grains and for the occurrence of bone tools in place of lithic blades or metal implements. The importance of the buffalo in the food economy of the Chalcolithic settlers at Kaothe points to the increasing dependence on that animal because of its considerable meat value and milk output. Interestingly, the percentage of buffalo bones from the Harappan site of Kuntasi in Saurashtra was also on the high side. This suggests a similarity between western Indian and the South-East Asiatic subsis-

tence system. Kaothe yielded as many as 38 faunal species "which considering the thickness of the deposit and the area excavated, the faunal assemblage is one of the largest compared to that from other archaeological sites".

Though Kaothe represents a seasonal settlement site it did yield evidence of what is known as an activity area. The central part was more dependent on subsistence farming and domesticated animals, compared with the peripheral areas which were occupied by hunters as evidenced by the high percentage of bones of wild species.

A large part of the Kaothe report is taken up by a discussion and analysis of burials and skeletal remains. The details bring out important information on dwindling life expectancy, poor health and an extraordinarily high rate of infant mortality, yet for the five odd burials excavated the

data is over documented and suggests a lack of a sense of proportion. This is not to belittle the painstaking research presented, but this aspect could have been whittled down a bit without loss of the essential facts.

In conclusion, it should be pointed out that the objective of the excavators was to unearth the housing pattern of the early farmers and their mode of living. This aim has been admirably achieved. The early settlers-cum-farmers had a flexible life style and a variable subsistence system. They qualify to be called the primary farming community of Maharashtra given to incipient agriculture, cattle farming and hunting. Thus the Savalda Culture at Kaothe was fully geared to meet all environmental exigencies.

Y.M. Chitalwala

Report on the 6th Conference of the International Council for Archaeozoology

The 6th Conference of the International Council for Archaeozoology (ICAZ) was held at the Smithsonian Institution in Washington, D.C., U.S.A., from the 21st to the 25th of May 1990. The ICAZ meetings are held every four years and the present conference was the first to be held in North America.

More than 350 scholars from 32 countries participated in this Conference. The Indian delegation included G.L. Badam, P.K. Thomas, and P.P. Joglekar (Deccan College, Pune), Ms. Ajita Patel (M.S. University of Baroda), and Ms. Indrani Dhar (Allahabad University, Allahabad).

In recognition of the archaeozoological work done at the Deccan College, Dr. P.K. Thomas was elected a member of the council of ICAZ with effect from 1990.

The central theme of the meeting was "Nature and Implications of Man/ Animal Interactions Over Time". The proceedings of the first day, including registration and plenary session were held in the Baird Auditorium of the National Museum of Natural History. The plenary session took the form of a discussion of the various approaches used in faunal analysis and of developing trends in archaeozoology. The speakers included Sandor Bokonyi from the Hungarian Academy of Sciences, Elizebeth Wing from the Florida Museum of Natural History, Sebastian Payne from the Museum of English Heritage and Donald Grayson from the Thomas Burke Memorial Museum. The discussion also covered the financial aspects of future archaeozoological research. Financial difficulties are being felt in all countries and many institutions fear closure. One session was dedicated to the multi-disciplinary nature of archaeozoological research and its development from zoology and palaeontology. H.P. Uerpman commented that archaeozoology has become the working slave of archaeology. This was in contrast to Sebastian Payne's comments emphasising the need for more archaeological knowledge.

More than 280 presentations were made in the three concurrent sessions encompassing eleven themes which were as follows:

1. Hunters, past and present
2. Human/animal relationships in emerging complex societies
3. Human/animal relationships in marginal or closed environments
4. Biological mechanisms behind osteological distinctions
5. Understanding marine and fresh water adaptations
6. Domestication: process, implications and future
7. Bone tools: technology and social context
8. Reading patterns in faunal assemblages
9. Isotopes and archaeozoology
10. Animal utilization in historic periods
11. Zoogeography and palaeoenvironment

The themes were further subdivided according to the area of study and methods employed. Research papers were grouped according to subjects, e.g. 'Human Impact on Island Faunas', 'Aging and Seasonality Studies', 'Animals in Ritual Contexts', 'Human versus Natural', etc. Some of the sessions like 'Marine and Fresh Water Adaptations in the New World' and 'Animals in Ritual Contexts' generated a good deal of discussion. Most of the presentations were made in English, though some were also made in French and German.

In addition to the regular sessions, the first international symposium on the 'Curation of Archaeozoological Materials' was held. Various themes were discussed regarding the preparation, conservation, cataloguing, storage and accessibility of osteological material. The goal of this workshop was to establish a set of guidelines and recommendations for the curation and conservation of archaeozoological collections. The creation of a central data bank for the identification of archaeozoological collections and for analytical data was also discussed.

The poster sessions were well presented and were concerned with the eleven themes mentioned above. Several workshops were held during the week. Sixty delegates participated in the workshop on experimental taphonomy conducted by Anna Behrensmeyer. This workshop primarily focused attention on a better understanding of bone modification processes that can be firmly established through experimentation with modern material. The 'Computers in Archaeology' workshop provided a forum for demonstrating animal bone recording programmes and curatorial data base management systems. The 'Incremental Structure' workshop was aimed at demonstrating the various processes available for embedding and sectioning of archaeozoological materials.

A number of visits to the Smithsonian Institution facilities were also organised for the ICAZ participants. Tours to the Vertebrate Preparatory Laboratory were conducted on two days. The scanning electron microscope laboratory was also opened to the participants for the

demonstration of dental microwear, of manufacturing and use wear traces, and of human and non-human marks on bones.

Dr. Melinda Zeder and Dr. Bruce D. Smith of the Department of Anthropology, Smithsonian Institution were largely responsible for the success of the conference. At the conference the organisers succeeded in bridging the gap between established scholars and young and aspiring ones in the field of archaeozoology. This also paved the way for discussions on the past, present and the future problems of the discipline. Interaction among scholars from various parts of the world also provided new ideas for future archaeozoological research.

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Report on the International Seminar on "Towards the Second Century of Archaeology in Sri Lanka"

The Department of Archaeology of the Government of Sri Lanka celebrated its centenary at Colombo from 7-13th July 1990. A number of academic and cultural activities were organised as part of the celebrations. The most important of these, no doubt, was an international seminar on the archaeology of Sri Lanka, and an excursion to important archaeological sites immediately after the seminar. The seminar was meticulously planned over a nearly two year period by Dr. Roland Silva, the extraordinarily dynamic and enthusiastic Director General of the Department of Archaeology, and his colleagues.

Around forty archaeologists from more than a dozen countries and a large number of archaeologists from Sri Lanka participated in the seminar. The largest number of foreign delegates was from India. They included M.K. Dhavalikar, V.N. Misra and M.D. Kajale from Deccan College, Pune, K.T.M. Hegde from M.S. University, Baroda, M.C. Joshi and K.V. Ramesh from the Archaeological Survey of India, E.V. Gangadharan from Andhra University, Waltair, and M.S. Nagaraja Rao from the Department of Archaeology and Museums, Mysore.

The seminar was inaugurated by Mr. D.B. Wijetunga, the Hon. Prime Minister of Sri Lanka at the Bandarnaike International Conference Hall during an impressive and solemn ceremony. The ceremony included a traditional Sri Lankan dance to welcome the dignitaries and other guests, lighting of the Ancient Elephant Lamp by the Prime Minister amidst the chanting of Seth Pirith, lighting of 100 oil lamps by ambassadors and foreign delegates, inauguration of an exhibition of Sri Lankan archaeology by the Prime Minister, cancellation and issuance of four centenary stamps with first day covers, discourses by religious leaders of various faiths, speeches by the Prime Minister and the Ministers of Socio-Cultural Integration, and Cultural Affairs and Information, the presentation of awards to former employees of the Archaeology Department, and finally a cultural show and dinner.

The exhibition put up on the occasion gave a comprehensive picture of the archaeological work done in Sri Lanka

during the preceding hundred years. Six other exhibitions were put up in the foyer of the Hilton Hotel, the venue of the seminar. These included: a) Foot-Prints of the Buddha in Thailand, b) Prehistoric Implements in Sri Lanka, c) Imported Ceramics found in Sri Lanka, d) Inscriptional Data on Sri Lanka, e) Early Photo Prints of the Monuments of Sri Lanka, and f) several book stalls.

The papers for the seminar were requisitioned well in advance. They were printed in six volumes of *Ancient Ceylon*, the journal of the Archaeology Department of Sri Lanka, and made available to the participants before the seminar. Nearly 120 papers were submitted for publication, and most of them were presented by their authors at the seminar. Only a few foreign authors were unable to participate and present their papers.

For presentation in the seminar the papers were divided into the following ten themes:

1. Letters, Literature and Archaeology (Literature)
2. Letters, Literature and Archaeology (Epigraphy and Letters)
3. Letters, Literature and Archaeology (Numismatics and Letters)
4. Man, Environment and Archaeology (Prehistory)
5. Science, Research and Archaeology (Excavation)
6. Science, Research and Archaeology (Conservation)
7. Science, Research and Archaeology (Documentation and Legislation)
8. Man, Environment and Archaeology (Environment)
9. Man, Environment and Archaeology (Planning)
10. Culture, Tourism and Archaeology (Art History)

The academic sessions of the seminar were held on 8-9 and 11-13 July. Papers were presented in 15 sessions, two concurrent sessions being held every day. The final session (16) was devoted to reporting of the proceedings by the chairmen of various sessions and to the consideration

and passing of resolutions.

Excursions to archaeological sites were organised on 10th July and from 13th to 20th July. On 10th July the delegates visited the Mesolithic cave site of Kitulgala Belilena situated in the Highland Wet Zone east of Colombo. Excavated by W.H. Wijepala over several seasons, the site has yielded a geometric microlithic industry, animal bones, shells, carbonised plant remains, and human skeletal remains. It is very well dated by a set of some 25 ¹⁴C dates which range from more than 27,000 B.P. to c. 3,400 B.P.

From 13th to 20th July the delegates were taken on a long tour which covered all the important archaeological sites in the country including those of the Cultural Triangle Project, but excluding those in the insurgency-affected areas of the north and northeast parts of the country.

The following sites were visited during the tour:

1. Dedigama Kota Vihara midway between Colombo and Anuradhapura
2. Anuradhapura capital complex. The localities visited here included Sri Maha Bodhi, Lovamahapaya, Jetavana Stupa and Vihara complex, Ruwanvalisaya, the excavation on the citadel mound, the Archaeology Museum, Abhayagiriya Dagaba site, the forest monasteries at Batahiramaya, the Isurumuniya Vihara and Museum
3. Mihintale. The localities visited included stupas, viharas, the hospital complex, and the site museum
4. Indikatusaya and the Kaludiya Pokuna
5. Kalawewa dam and reservoir. The visit included an illustrated and informative talk on the ancient irrigation works of Sri Lanka by Mr. Denis Fernando, chief of the Mahaveli irrigation project
6. Avukana Buddha Image
7. Polonnaruwa. The sites visited included the Cultural Triangle Project Office, Polonnaruwa ruins and the Alahana Pirivena Project
8. Dambulla rock temple and excavated Megalithic site
9. Sigiriya water gardens, frescoes, and palace complex
10. Kandy. Sites of the Cultural Triangle Project and a puja was performed at the Sri Dalada Maligava (Sacred Tooth Relic)
11. Peradeniya University Library and Archaeology Department. On this occasion the Prof. Parnavitana Archaeology Museum was inaugurated and Prof. P.L. Prematillake was felicitated.
12. Buduruvagala
13. Dambegoda and Maligavila
14. Kataragama

15. Tissamaharama

16. Galle

A brief description of some of the sites visited by the delegates is given below:

Cultural Triangle Project (CTP). This is an ambitious project for the excavation, conservation and development of important archaeological sites in the country, and is financed by the Central Cultural Fund (CCF). The Fund was set up by an act of Parliament in 1980 and it is managed by a Board of Governors with the Prime Minister as its Chairman. Dr. Roland Silva, Director General of Archaeology is Director General of the CCF. UNESCO has made a handsome contribution to the Fund.

Geographically the Cultural Triangle is formed by the axis Kandy — Anuradhapura — Polonnaruwa — Kandy. Within this area the excavation and conservation of six ancient sites are being looked after by the CTP. The Departments of Archaeology of several Sri Lankan universities like Colombo, Kelaniya, Jayawardhanapura and Peradeniya are collaborating with the Government Department of Archaeology in executing these projects. The six projects are: 1. the Jetavana Monastery at Anuradhapura; 2. the Abhayagiri Monastery at Anuradhapura; 3. the Alahana Pirivena at Polonnaruwa (burial ground, monastery and hospital); 4. Sigiriya (royal and urban complex); 5. Dambulla (monastery, stupa and wall paintings); and 6. Kandy (several palaces and religious buildings).

The work on these projects involves excavation to expose the last phase of the buildings, establishment of culture sequences through test pits, maintenance of the records of findings, conservation of structures, landscaping of surroundings for the benefit of visitors, and publication of reports. Though the main objective of the CTP is to save the Buddhist cultural heritage, in the process of field work several Hindu shrines and associated artefacts and sculptures have been excavated, preserved and reported upon. Various sub-programmes have been launched to develop laboratory analyses of various kinds and train archaeologists in the laboratory work, to develop computerized registration of artefacts, and to train architect conservators, etc. An important aspect of these projects is Cultural Resource Management Programme. The Programme is intended to make the sites accessible to the public through restoration, landscaping, publication, etc., and thereby enlarge the scope of archaeology from a narrow academic discipline to one of public involvement in the protection of the national heritage. In this process archaeology is playing an important social role.

Some important features of the sites visited by the delegates are briefly described below:

Dedigama. The Suthighara Chetiya (stupa) was built by King Parakramabahu I in the 12th century at the place of his

birth. It was later enlarged by incorporating the older smaller stupa in it. The stupa complex includes a functioning monastery.

Anuradhapura. Jetavana Vihara is the largest stupa in the world with a height of about 125 m and was constructed by King Mahasena in the 4th century A.D. Among the monuments of the ancient world the Jetavana stupa is surpassed in height only by the Giza Pyramids, the tallest of which is about 160 m high.

Abhayagiri Vihara. The Abhayagiri stupa is the second largest stupa with a height of about 115 m. It was constructed by Vattagamini Abhaya in the second century B.C.

Polonnaruwa. Alahana Pirivena is a university of the 12th century A.D. which has been in ruins for a long time. The excavations here are providing valuable glimpses of this ancient institution.

Sigiriya. The lofty and imposing rock of Sigiriya stands out in the midst of a vast plain, about 165 km to the northeast of Colombo. Its history is known to us from the Mahavamsa, the Sri Lankan chronicle. King Dhatusena who ruled at Anuradhapura had two sons, Kassapa by a wife of unequal birth, and Moggallana born of the anointed Queen. Kassapa, with the help of the Army Chief took his father prisoner and

eventually buried him alive in a wall. Moggallana escaped to India to raise an army. Fearing Moggallana's return and eventual revenge, Kassapa took refuge in the inaccessible stronghold of Sigiriya. There he built a marvellous palace on top of the hill, ordered the execution of frescoes in the hollows on the sides of the hill, and laid out gardens with elaborate water supply systems at the foot of the hill. In their artistic layout and technical perfection these gardens surpass even the contemporary Persian gardens. To reach the palace Kassapa built a staircase in the form of a lion. Hence the place got its name as Sihagiri. To atone for his crimes Kassapa embraced Buddhism and founded a monastery at Anuradhapura. After Moggallana's return from India Kassapa attacked him but his army fled and eventually he committed suicide. Afterwards Sigiriya was abandoned and a jungle gradually grew over it. It was only in the early 19th century that the site was discovered by the British. Extensive excavations and conservation work have been carried out at the site during the last century, and they are still in progress.

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Report on the 14th International Congress of the Indo-Pacific Prehistory Association

The 14th International Congress of the Indo-Pacific Prehistory Association (IPPA) was held at Yogyakarta in Java, Indonesia from August 25-September 2, 1990. There were several reasons for holding the Congress at Yogyakarta. Firstly, it is well connected with the capital, Jakarta, by road, train and air. The city also reflects the hi-tech modernisation of the country as well as its ethnic culture, dress and tradition of hospitality. Secondly, and more important, is its proximity to the famous hominid sites of Trinil and Sangiran, the well known Buddhist stupa at Borobudur and the Hindu temple complex, known as Lara Jonggrang, at Prambanan. The Congress also coincided with the celebration of the centenary of the discovery, by the Dutch scholar Eugene Dubois, of the first hominid fossil in Java, indeed in the whole of the Asia.

The Congress was jointly organised by the Indo-Pacific Prehistory Association, Canberra; the National Research Centre of Archaeology, Jakarta; and the Association of Indonesian Prehistorians.

The Congress received co-operation, support and financial assistance from various people and organisations from several countries, namely Indonesia, Australia, Japan, India, and the U.S.A.

About 200 delegates from 27 countries, predominantly from South-East Asia and the Pacific, participated in the Congress. The countries represented were Australia, Brunei, Canada, People's Republic of China, Denmark, England, France, Hong Kong, India, Indonesia, Italy, Japan, Korea, Malaysia, Netherlands, New Caledonia, New Zealand, Papua New Guinea, Philippines, Taiwan, Singapore, Solomon Island, Sri Lanka, Switzerland, Thailand, the U.S.A., and Vietnam.

The Congress opened on 25th August at the Sahid Garden Hotel, Yogyakarta. The inaugural speech was given by Prof. Faud Hassan, the Minister for Education and Culture. After the speech, Prof. Hassan rang a bell which traditionally marks the auspicious beginning of any ceremony.

The Congress was divided into four broad themes. These were:

- I: Hominid expansions, technology and biology in the Indo-Pacific region
- II: Agriculture and its consequences in Indo-Pacific Prehistory
- III: Early complex societies in Southern and Eastern Asia and Oceania
- IV: The genesis of Indo-Pacific populations

Each theme included several sessions and sub-sessions. In all, 170 papers were presented. The topics discussed during the Congress ranged from the first discovery of fossil hominids in Indonesia to trade and exchange systems in East and South-East Asia. They included population expansions, development of tool-technology in the Indo-Pacific region, development of social complexities in the Indo-Pacific region, antiquity of hunter-gatherers in South-East Asia, the transition to agriculture in the Pacific region and human evolution in Southern and Eastern Asia.

For the first time a session exclusively on *Studies in the Pleistocene of India* was arranged at the IPPA Congress. The session was convened by Prof. V.N. Misra. Another session on the *Transition to Agriculture in India* was convened by Prof. Asok K. Ghosh.

The session, *Studies in the Pleistocene of India*, included the following speakers and topics:

- Ravi Korisettar: A 1.4 myr volcanic ash layer in the Deccan Volcanic Province and its importance for Quaternary studies in peninsular India
- R.K. Ganjoo: On the problem of the provinciality of the Pleistocene vertebrate fauna of the Indian subcontinent
- G.L. Badam: Preliminary taphonomic studies of Quaternary mammalian fossils in Central and Western India

- Arun Kumar: A palaeoenvironmental study of Acheulian sites in the northern Deccan with specific focus on the Gangapur Acheulian site
- V.N. Misra: An early Middle Palaeolithic site in the Narmada Valley
- Giriraj Kumar: Palaeolithic mobiliary art and ornamentation in India
- K.C. Tripathy: Fresh light on lithic evidences from the Eastern Ghats, Orissa

The session on *Transitions to Agriculture in India* included the following speakers and topics:

- Ravindra Kumar: Dispersal of settlements in the Middle Gomati Basin an archaeological investigation
- Ranjana Ray: The socio-economic implications of pottery technology in India
- Asok K. Ghosh: Changing situations from hunting-gathering to food production among two selected present-day tribal groups of India

Besides these, Himanshu P. Ray presented a paper on "In search of Suvarnabhumi: Early networks in the Bay of Bengal" in the sub-session on *Trade Exchange in South and Eastern Asia*.

The general body meeting discussed various issues related to improvement in co-ordination among the archaeologists of South and South-East Asia. A condolence resolution was passed offering homage to departed archaeologists of the Indo-Pacific Region including Prof. H.D. Sankalia of India. The executive committee of the IPPA has decided to publish the proceedings of the Congress by the end of 1991 so that all archaeologists would be apprised of the latest research in South and South-East Asia.

The organisers had arranged for a one-day tour around Jakarta for the delegates arriving a day before the commencement of the Congress. The tour included visits to national monuments, as well as to the National Museum and Taman Mini Indonesia, which is a model reconstruction of the village settlements and activities of the tribes of Indonesia.

There were interesting intra-Congress excursions on the 28th and 30th of August. The first one was to the famous palaeoanthropological sites of Trinil and Sangiran. Sangiran is about 75 km east of Yogyakarta and has yielded fossil *Pithecanthropus* (Java Man). Fossils of *Stegodon*, *Elephas*, *Rhinoceros*, crocodiles, deer, pigs and apes have also been found in association with the remains of Java man. Another site which has yielded fossils of *Homo erectus* (*Pithecanthropus*) is Trinil, about 85 km east of Sangiran, where the fossil hominid was first found by the Dutch scientist, Eugene Dubois in 1891. The site of the fossil find is on the right

bank of the river Solo. A small site museum displays the casts of the fossil hominids and fossils of various megavertebrates found in association with the fossil hominid. A memorial stone has been installed near the site museum, on the left bank of the Solo river (opposite the fossil hominid find spot), indicating the year of the discovery of the *Pithecanthropus*. The excursions to these sites were extremely educative in providing an understanding of the context of the fossil hominids and the controversy surrounding their nomenclature and age.

This was followed by a brief but interesting visit to the city of Solo where a public exhibition was being held to celebrate the centenary of the discovery of 'Solo Man'. The display at the exhibition was made with the expertise of French archaeologists and anthropologists.

The second excursion was to the famous Buddhist stupa of Borobudur which was built in the 9th century and which is located about 40 km northwest of Yogyakarta. The name of the stupa is derived from a compound of *bara* (*vihara*) which means dormitory or monastery and *budur* which means foundation on a hill. The temple is situated within a chain of beautiful mountains. A series of volcanoes (Merapi, Merbabu, Sumbing, and Sundoro) form the backdrop of the magnificent temple. The temple of Borobudur remained unnoticed for centuries because it was covered by earth, volcanic ash and dust. The restoration of the temple was carried out from 1907-1911 by Th. Van Erph. The second phase of restoration was done between 1970 and 1983 by the Indonesian Government with financial assistance from UNESCO, and under the able supervision of Dr. Soekmono. Subsequently, we visited Prambanan, the site of a complex of Hindu temples located about 14 km east of Yogyakarta. This complex, which was built between the 8th and 10th centuries, consists of three main temples of Vishnu, Shiva and Brahma and over 100 subsidiary temples. Most of the temples have largely collapsed over the centuries, but the temples of the trinity are being restored by the Government of Indonesia.

The delegates were also taken to the Laboratory of Bioanthropology and Palaeoanthropology, Gadjah Mada University, Yogyakarta. The laboratory has a museum with a fine display of the original hominid fossils found in Indonesia, including casts of those fossils whose originals are in museums in the Netherlands. The visit to the Laboratory enhanced our knowledge of the recent finds of fossil hominids from South-East Asia.

The delegates were fortunate to have an opportunity to see the Ramayana ballet at Yogyakarta. Indonesian ballet is well known all over the world for its ethnic quality, astounding presentation and delicacy of its dancers. Besides, it reflects the preservation of their cultural heritage. The entire epic of the Ramayana was narrated in a three hour breathtaking performance.

The Congress ended on September 2nd with a cultural evening at the Sahid Garden Hotel. The President of the Indo-Pacific Prehistory Association expressed his appreciation of the efforts of Prof. R.P. Soejono and his colleagues, and thanked the organisers on behalf of the delegates. The credit for the successful organisation of the Congress goes largely to Prof. R.P. Soejono (Chairperson of the Organising Committee), and to Dr. Peter Bellwood (Secretary of the

Organising Committee and General Secretary of the IPPA). The next Congress of the IPPA is scheduled to be held sometime in 1994 in Thailand.

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Report on the Seminar on "Environmental Change and Human Response: Last Two Million Years"

During last two decades or so there has been a growing awareness among Indian archaeologists of the importance of the study of past environments for a better understanding of ancient cultures. Several multidisciplinary projects have been carried out, particularly in Kashmir, Rajasthan, Son and Narmada river valleys (central India), and western India. There has also been a noticeable shift in research strategies in Pleistocene and early Holocene studies from exploration to the excavation of relatively undisturbed sites and regional studies. In the field of pre-Iron Age farming cultures and the Indus Civilization new approaches of site catchment analysis, subsistence and settlement systems, studies of nutritional systems, health status, and life expectancy of human populations, etc. are being employed.

To take stock of the recent advances in our knowledge of the interaction between environmental changes and human adaptations to them during the Quaternary period an international seminar was organised by the Department of Archaeology, Deccan College Post-Graduate & Research Institute from 19 to 23 December 1990. The seminar was financed by the University Grants Commission and the Indian Council of Historical Research, New Delhi. It was inaugurated by Professor S.C. Gupte, Vice-Chancellor, Poona University. Dr. S.G. Sahasrabudhe, a former Director of the Geological Survey of India chaired the inaugural function and gave the keynote address. The participants in the seminar included about twenty-five persons from the Deccan College, thirty persons from several Indian universities and other research institutions (universities of Aligarh, Andhra, Allahabad, Baroda, Calicut, Hyderabad, Karnataka, Nagarjuna, Panjab, Ravishankar, Tamil, and Trivandrum, as well as Archaeological Survey of India, New Delhi, Wadia Institute of Himalayan Geology, Dehradun, and Physical Research Laboratory, Ahmedabad), and two scholars each from the U.S.A. and Italy.

About fifty papers were presented at the seminar under the following five themes:

1. Palaeolithic Studies
2. Quaternary Chronology and Biophysical Environment
3. Mesolithic Studies
4. Protohistoric Studies
5. Ethnoarchaeology

The range of papers presented at the seminar covered new evidence of Acheulian culture in Rajasthan, Maharashtra and Karnataka, study of Pleistocene environments and Man-Land relationships in western Maharashtra and Karnataka, dating of Quaternary deposits in Rajasthan and Maharashtra by radiometric techniques, Quaternary faunal remains, Mesolithic adaptations to Holocene climatic changes, Harappan settlements in Gujarat, Chalcolithic cultures of northern Deccan, Neolithic cultures of the southern Deccan, effects of hydrological changes on early agricultural settlements in the Ganga plains, effects of early Neolithic on the ecology of the Levant, monsoon predictions, and ethnoarchaeological studies on mainland and in the Andaman Islands.

The proceedings of the seminar are planned to be published by the Deccan College.

V.N. Misra
Department of Archaeology
Deccan College, Pune

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c/o Department of Archaeology
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Report of the General Secretary for 1990-91 (1.4.1990 to 31.3.1991)

This year of the Society has been academically fruitful. The Society has gained considerable financial stability from the major one time grant of the Ford Foundation, New Delhi and from the regular grant from the Archaeological Survey of India, New Delhi and the Indian Council of Historical Research, New Delhi both for the publication of the journal and organising of the annual conference.

Man and Environment

This year has been the second year of the bi-annual series of the Journal. As agreed upon, the first issue of this second bi-annual series was published in June 1990 (Volume XV, No. 1). It carried the Presidential Address of Prof. B.L.K. Somayajulu on *Geochronological and Geochemical Approaches to the Study of Quaternary Climates*, read at the XVIIIth Annual Conference of the Society held at Guntur. Articles on various aspects of archaeology and allied branches of research were published in this issue. These included articles on the prehistory of the Son Valley, three articles on Ostrich egg shells and related problems, excavation reports of the Neolithic site of Elchuru and Megalithic site of Kongu Region, geomorphological investigations at the excavated prehistoric site of Samnapur, ethnographic studies from the Andaman group of islands, and questions related to the genetic evidence of *Bos* species.

The second issue (Vol. XV, No. 2) was published in December 1990. It contained articles on the recent controversies on the Plio- Pleistocene boundary, discovery of handaxes in Nepal, preliminary report of the excavations at the Mesolithic site of Dhansura, settlement and subsistence patterns of Neolithic cultures in Lower Krishna valley and Malwa culture in Maharashtra, and ethnographic study of Kanjars and Van Vagris.

The June issue (Vol. XV, No. 1) was typed entirely on a Word Processor by members of the editorial board and pains were taken to see that the copies sent to the press are as far as possible error free. However, we accept that despite our best efforts there may be some typographical mistakes remaining in the final printed copy. We sincerely acknowl-

edge the efforts of Mr. Sujit Patwardhan and his colleagues at Mudra press and are grateful for their cooperation.

Annual Conference

The XVIIIth Annual Conference of the Society was held at Vivekananda Kendra, Kanyakumari from November 11 to 13, 1990. Prof. K.S. Vaswani, Vice-President of the Kendra was the Local Secretary. The Society is grateful to Prof. Vaswani and his colleagues at the Kendra, especially Shri Vasudeo, Shri Mahadevan, Shri Angiras, Shri Swamiji and the Manager, for all their help and cooperation.

The Conference opened with the welcome speech by Dr. S.P. Gupta. It was followed by the formal inauguration of the Conference by Prof. Vaswani. Prof. V.N. Misra also welcomed the delegates and Prof. S.N. Rajaguru gave the vote of thanks. Immediately after that followed the Presidential Address by Shri J.P. Joshi for the Indian Archaeological Society. The Presidential Address of the Indian Society for Prehistoric and Quaternary Studies was read out by Prof. S.N. Rajaguru for Prof. K.T.M. Hegde, the President, who is on an assignment in the U.S.A.

The following members of the Indian Society for Prehistoric and Quaternary Studies participated in the Conference:

1. P. Ajithprasad 2. Shashi Asthana 3. G.L. Badam 4. K.K. Chakravarty 5. R.D. Choudhary 6. Zarine Cooper 7. Gauri Deshpande 8. Hemangi Deodhar 9. M.V. Desai 10. R.K. Ganjoo 11. Savita Ghate 12. N.C. Ghosh 13. Mozammul Hoque 14. Kirti Jain 15. P.P. Joglekar 16. Ravi Korisetar 17. K. Krishnan 18. Giriraj Kumar 19. B.B. Lal 20. S.K. Lekhwani 21. Shiela Mishra 22. R.K. Mohanty 23. Malti Nagar 24. W.V.S. Narasimhan 25. S.B. Ota 26. R.P. Pandey 27. S.K. Pandey 28. Nirmala Pandey 29. S.N. Rajaguru 30. K. Rajan 31. K.V. Soundara Rajan 32. P. Rajendran 33. Rajam Seshadri 34. Gopal Shesh 35. P.K. Shukla 36. A.K. Singh 37. B.P. Sinha 38. V.H. Sonawane 39. K.V. Soundara 40. A. Sundara 41. P.K. Thomas 42. LuAnn Wandsnider

The Presidential Address on "Ancient Indian Iron Metallurgy" by Prof. K.T.M. Hegde was read out by Prof. S.N. Rajaguru. The first H.D. Sankalia Memorial Lecture was given by Prof. B.B. Lal on "Planned Cooperation between Archaeologists and those Versed in Ancient Literature — A Crying Need".

The Conference consisted of Seminar and Open Session. The topic of Seminar Session was "Coastal Environments and Human Adaptations". The following papers were read in the Seminar and Open Sessions:

Seminar

Zarine Cooper: The Concept of Adaptations to Island Economies in the Bay of Bengal

P. Rajendran: Recent Archaeological Finds from Coastal Kerala

K. Rajan: Archaeology of Dharamapuri District, Tamil Nadu

Kirti Jain: Coastal Adaptations: A Case Study of the Son Kolis

Open Session

P.K. Thomas: Faunal Background of the Iron Age Culture of Maharashtra

G.L. Badam: Taphonomy and Decomposition of Large Mammal Carcasses in the Nilgiris, Tamil Nadu

H. Deodhar & S.N. Rajaguru: Neogene Climate of Western India

V.N. Misra, S.N. Rajaguru & R.K. Ganjoo: Further Research in the Late Quaternary Geology and Archaeology of the Narmada Valley

P.P. Joglekar & M.S. Vaishampayan: Some Basic Issues Related to Metrical Analysis of Stone Tools

S.B. Ota: Towards the Interpretation of Artefacts Scatter Pattern: An Experimental Study

P. Ajithprasad: Acheulian Culture in the Orsang Valley: A Regional Approach

Ravi Korisettar: Middle Palaeolithic Culture of the Middle Krishna Basin, Karnataka: A Study

Shiela Mishra: Use of Micaceous Schist in Upper Palaeolithic Cultures of Western India

Savita Ghate: Blade Tool Technology of Kuntasi

Suman H. Pandya & M.V. Desai: Mesolithic Remains and the Sand Dunes of Dhansura Region: Their Interrelations

Giriraj Kumar: New Dimensions in Purakala Study

R.K. Pancholi: The Chaturbhujanath Nala, Most Important Prehistoric Rock Art Gallery of Chambal Valley (in Hindi)

Malti Nagar: Hunting Technology and Techniques Among the Pardhis of Central India

K. Krishnan: An Analysis of Decorative Pigments and Slips on Harappan Pottery from Gujarat

Rajam Seshadri & K.T.M. Hegde: The Composition and Smithery Techniques of Copper Artefacts from Nagwada - A Preliminary Study

V.H. Sonawane: Some Interesting Harappan Gold Ornaments from Gujarat

R.K. Mohanty: Vidarbha Megaliths: A Need for an Integrated Approach to Field Investigations

P.K. Shukla: Rock Paintings of Gupha Manser, Dist. Vidisha

A valedictory session was held at 6.00 p.m. on 13.11.1990. It was presided over by Prof. B.P. Sinha, the Chairman of the Society.

A Post-Conference One Day Field Study Tour of the coast-line near Kanyakumari had been arranged on 14.11.1990.

Life Members

There have been several additions to the list of Life Members this year and this is encouraging as many new members who have joined the Society have increased its representation in new parts of the country as well as abroad. The following Life Members have been welcomed to the Society this year:

New Life Members

1. Asok Datta 2. M.V. Desai 3. Madhuca Geethakrishnan 4. Luther Goudeller 5. Vilas Jadhav 6. P.S. Joshi 7. Shanti Pappu 8. Sadasiba Pradhan 9. S. Prathapachandran 10. B.P. Radhakrishna 11. P. Rajendran 12. Gary O. Rollefson 13. Shyam Sunder Saxena 14. Sudarshan Seneviratne 15. Ashvini Kumar Sharma 16. Krishna Gopal Sharma 17. P.S. Sriram 18. Elizabeth Thomas

The total number of Life Members now is 232.

Annual Members for 1990

1. K.K. Chakravarty 2. Gauri Deshpande 3. Rajam Seshadri 4. Saji Thomas 5. LuAnn Wandsnider

Meeting of the Executive Committee of the Society

The following are minutes of the Executive Committee of the Society held on 12.11.1990 at 2.30 p.m. at the Vivekananda Kendra (Hall 8C):

Members present:

1. V.N. Misra 2. S.N. Rajaguru 3. S.P. Gupta 4. Malti Nagar 5. P. K. Thomas 6. R.K. Ganjoo 7. Ravi Korisettar 8. Giriraj Kumar

Dr. S.P. Gupta chaired the meeting.

The following business was transacted at the meeting:

1. The General Secretary presented the report of the activities and achievements of the Society for the year 1989-90 and the audited statement of accounts, both of which are published in *Man and Environment*, Vol. XV, No. 1 (pp. 121-127). The meeting unanimously approved the report and the statement of accounts.
2. The Chairman of the meeting, Dr. S.P. Gupta, proposed the name of Prof. B.B. Lal for the Presidentship of the Society for the year 1991. Prof. V.N. Misra seconded the proposal and it was unanimously accepted by the Committee.
3. Prof. V.N. Misra proposed the name of Prof. M.N. Deshpande for the H.D. Sankalia Memorial Lecture to be delivered at the XIXth Annual Conference of the Society. Prof. S.N. Rajaguru seconded the proposal and the committee unanimously accepted it.
4. It was agreed upon by the Committee to formally declare the H.D. Sankalia Young Archaeologist Award open and invite research papers for the competition from young archaeologists. The last date for submission of the research papers should be July 31 every year. The committee unanimously accepted the proposal.
5. The committee accepted the invitation from Dr. K.K. Chakravarty, Commissioner, M.P. State Archaeology and from Prof. A. Sundara, Department of Ancient History and Epigraphy, Dharwad to hold the subsequent two annual conferences, i.e. XIXth and XXth Annual Conferences, at Bhopal and Dharwad, respectively in the year 1991 and 1992.

The meeting ended with a vote of thanks to the Chair.

S.N. Rajaguru
General Secretary

Read and confirmed
sd/-
S.P. Gupta
Chairman

Meeting of the General Body of the Society

The General Body Meeting was held on 13.11.1990 at 5.00 pm at Vivekananda Kendra (Hall 8B). The following members of the Society were present at the meeting:

Prof. B.P. Sinha presided over the meeting of the Society.

The following business was transacted at the meeting:

1. The report of the activities and achievements of the Society for the year 1989-90 was presented by the General Secretary and unanimously approved by the members.
2. The General Secretary presented the audited statement of accounts for the year 1989-90 which was unanimously approved by the members of the Society.
3. The General Secretary formally announced the H.D. Sankalia Young Archaeologist Award open for competition from the year 1991.
4. Professor B.B. Lal was unanimously elected as the President of the Society for the year 1991.
5. Professor M.N. Deshpande was unanimously elected as speaker for the H.D. Sankalia Memorial Lecture for the year 1991.
6. The General Secretary proposed the name of Dr. Zarine Cooper, Deccan College, Pune as an Associate Editor of the journal *Man and Environment*. This was unanimously approved.
7. The General Secretary proposed the name of Mr. P.P. Joglekar, Deccan College, Pune as the Assistant Secretary of the Society. This was unanimously approved.
8. The General Secretary proposed to promote Dr. R.K. Ganjoo from the post of Assistant Secretary to the post of Joint Secretary which was unanimously approved.
9. It was agreed to have the venue of the next annual conference at Bhopal or Dharwad, subject to the order in which the invitations are received.

S.N. Rajaguru
General Secretary

Read and confirmed
sd/-
B.P. Sinha
Chairman

Finances of the Society

The Society received a grant of Rs. 15,000 from the Indian Council of Historical Research, New Delhi and Rs. 20,000 from the Archaeological Survey of India, New Delhi for the publication of the journal *Man and Environment*, Vol. XV, No. 2, December 1990. A grant of Rs. 7,500 was also received from the Indian Council of Historical Research to organise the seminar on "Coastal Environments and Human Adaptations" at Kanyakumari. We gratefully acknowledge

the financial assistance so generously and regularly provided by these two bodies. An audited statement for the year 1990--91 of the Society's accounts is printed on the following pages.

sd/-
S.N. Rajaguru
General Secretary

INDIAN SOCIETY FOR PREHISTORIC AND QUATERNARY STUDIES
 c/o Department of Archaeology, Deccan College, Pune 411 006
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31.03.1991

EXPENDITURE	AMOUNT	INCOME	AMOUNT
Establishment Expenses		Bank Interest	2,078.45
Printing (A/c. No. 2107)	35,962.50	Accrued Interest (But not received)	63,344.52
Stationery (A/c. No. 2107)	9,274.50		
Bank Commission	150.00		
Honorarium	1,200.00	Grants	
Postage (A/c. No. 717)	3,151.55	I.C.H.R. (For Conference)	14,625.00
Advance Tax	1,403.00	Grant for M & E (A.S.I.)	35,300.00
Travelling (A/c. No. 717)	5,224.00	Grant for M & E (I.C.H.R.)	1,125.00
Accounting Charges (A/c. No. 717)	240.00		
Petrol (A/c. No. 717)	678.50		
Miscellaneous (A/c. No. 717)	33.00	Other Income	
Telephone (A/c. No. 717)	154.00	Life membership fee	22,010.00
Tea	79.00	Cost of reprint	1,175.00
Depreciation on		Royalty	5,509.00
Furniture	214.25	Sale of M & E	700.00
Computer Printer	4,443.89	Registration fee	7,600.00
Expenditure on object of the Trust			
Pub. of M & E. (A/c. No. 717)			
Printing	27,371.40		
Stationery	7,683.00		
Typing	416.00		
Postage	1,791.10		
Conference Expenses (A/c. No. 717)			
Printing & Stationery	5,743.30		
Travelling & Incidental Charges	9,371.00		
Rent	7,500.00		
R.B. Mote & Co.			
Surplus transferred to Balance Sheet			
Total	1,53,471.97	Total	1,53,471.97

(S.N. Rajaguru)
Gen. Secretary

(R.K. Ganjoo)
Jt. Secretary

(P.K. Thomas)
Treasurer

R.B. Mote & Co.
Chartered Accountants

INDIAN SOCIETY FOR PREHISTORIC AND QUATERNARY STUDIES
c/o Department of Archaeology, Deccan College, Pune 411 006
BALANCE SHEET AS AT 31.03.1991

LIABILITIES	AMOUNT	ASSETS	AMOUNT
Other earmarked Funds	6,08,108.10	Investments	
Liabilities for Expenses		F.D.R. with Central Bank of India	6,62,000.00
R.B. Mote & Co.	2,250.00	Furniture & Fixtures	1,928.20
		Computer Printer	8,889.11
Income & Expenditures Account		Income Outstanding	
As per last Balance Sheet	1,39,234.68	Accrued Interest on F.D.R.	12,969.11
Add: Surplus	29,137.98		
		Cash & Bank Balance	
Provision for Contribution		Bank A/c. No. 717	48,341.08
		Bank A/c. No. 2107	44,191.20
		Stamp in hand	194.55
		Cash in hand	423.40
		R.K. Ganjoo	389.05
			93,538.28
Total	7,79,324.70	Total	7,79,324.70

(S.N. Rajaguru)
Gen. Secretary

(R.K. Ganjoo)
Jt. Secretary

(P.K. Thomas)
Treasurer

R.B. Mote & Co.
Chartered Accountants

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Professor H.D. Sankalia Memorial Fund — An Announcement

Pupils, colleagues and admirers of the late Professor H.D. Sankalia, spread all over the country and abroad, have recently instituted a Fund at the Deccan College Post-Graduate and Research Institute, Pune to perpetuate his memory. So far a sum of about Rs. 30,000/- has been collected for this purpose. A committee consisting of the following members is in charge of all matters pertaining to the utilization of this Fund.

Professor V.N. Misra	Chairman
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Mr. S.T. Bharné	Member
Mr. N.S. Gaware	Secretary-cum-Treasurer

Among Professor Sankalia's major contributions towards the development of archaeology in India mention deserves to be made of the close and fatherly interest he took in the training and academic progress of both M.A. and research students. With a view to highlighting this particular aspect of Professor Sankalia's contributions to modern archaeology, the Fund has made provision for the award of a Gold Medal to the student standing First at the M.A. Examination in Ancient Indian History, Culture and Archaeology of the University of Poona (or of the Deccan College Post-Graduate and Research Institute when it starts functioning as a Deemed to be University). The Gold Medal for 1990 was awarded to Ms. Rukshana Nanji (who secured an aggregate of 72.5% marks) on 19 December 1990 by Prof. S.C. Gupte, Vice-Chancellor, Poona University, during the inaugural function of the International Seminar on *Environmental Change and Human Response: Last Two Million Years*, organised by the Department of Archaeology, Deccan College. Henceforth the medal will be awarded on 17 August which is the Foundation Day of the Institute.

The committee administering the Fund has also deemed it fit to institute a cash prize of Rs. 500/- and a citation to be awarded annually for the best research article/paper published in an Indian or foreign journal by a research student (Ph.D./M.Phil) of any recognized university/research

institute in India. The areas of research covered for this purpose include Ancient Indian History, Culture and all branches of Archaeology. Reporting of a significant body of new data, novel interpretations of available material or evidence, and putting forward new ideas adding significantly to the theory and methodology of research will be the main criteria for selecting articles/papers for the award. Eligible candidates are requested to send three copies of the reprints of their papers/articles along with their bio-data and a certificate from the Head of Department/Institution certifying the candidate's status as a research student. All relevant material should be sent to: Chairman, Professor H.D. Sankalia Memorial Fund c/o Department of Archaeology, Deccan College, Pune 411 006 before 30 June every year.

The Archaeology Museum of Deccan College has made provision for the creation of a Sankalia Memorial Gallery, and work is in progress. This gallery will display write-ups, charts, photographs and other memorabilia highlighting Professor Sankalia's multi-sided contribution to the development of Indian Archaeology. It has also been proposed to store his voluminous correspondence and other papers as archival material. As and when sufficient funds become available, a bronze bust of Professor Sankalia will be prepared and installed in this gallery.

Indian as well as outside admirers of the late Professor Sankalia who wish to associate themselves with the Fund are requested to send their contributions (crossed cheques/bank drafts drawn in favour of: Secretary, Professor H.D. Sankalia Memorial Fund) to Chairman, Professor H.D. Sankalia Memorial Fund c/o Department of Archaeology, Deccan College, Pune 411 006.

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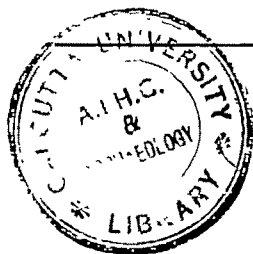
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Editorial

This issue of *Man and Environment* carries five articles on the prehistoric art of India, Australia and France, each dealing with a distinctive aspect of the subject. Even though India is one of the richest areas of the world in rock art — both prehistoric and historic — the subject has, until recently, received little attention from Indian archaeologists. The only scholar who took the study of rock art seriously was the late Dr. V.S. Wakankar. By his dedicated field work over thirty years in Central India, in particular, and peninsular India, in general, he succeeded in enthusing a number of young researchers to take up the documentation and analysis of rock art. The number of papers in this issue and one of the earlier issues (XIV, No. 1) of this Journal is reflective of this increased and welcome interest. The article by Michel Lorblanchet, albeit a reprint of the original French version, now becomes available to readers in India. It provides a very detailed and valuable insight into the manner in which the study of art forms as diverse as the cave art of the reindeer hunters of western Europe and the rock art of the kangaroo hunters of Australia can complement each other. This forms part of the modern "comparative" trend in historical research which looks for both similarities and differences in time and space to further our understanding of the prehistoric past. The other articles on rock art provide an interesting spectrum ranging from evidence of head-hunting to the introduction of wheeled transport and mounted animals. A stylistic analysis of the rock art of Andhra Pradesh has been presented for the first time, as well as the discovery of a painted jar from a Harappan context in Gujarat, with what has been suggested, is a representation of Siva as *pasupati*. We have an interesting article from Robin Dennell and Helen Rendell reassessing the 1939 contribution of De Terra and Paterson to the archaeology and geology of northwest India — now northern Pakistan. The article by Douglas Price throws new light on the postglacial Mesolithic hunter-gatherers of northern Europe. We continue our series of statistical contributions on the study of *Bos* species and also a report on floral remains.

We would like to remind our contributors to provide abstracts with their articles as these are also to be published in one of the journals of the Geological Society of India.

The response from scholars throughout India, and most encouragingly, also from overseas is gradually but steadily growing. We are deeply thankful to our contributors for their support in enlarging the scope of the Journal, both thematically and geographically.

Readers will recall that the Society had instituted the Professor H.D. Sankalia Memorial Lecture and the Professor H.D. Sankalia Memorial Young Archaeologist Award. The first lecture was delivered by Prof. B.B. Lal at Kanyakumari and was published in *Man and Environment* Vol. XVI, No. 1. The second lecture will be delivered at the XIXth Annual Conference of the Society (December 1991) at Bhopal by Mr. M.N. Deshpande, a former Director-General of the Archaeological Survey of India and one of the first pupils of Prof. Sankalia. We have also received contributions for the Young Archaeologist Award. These will also be read at this Conference and hopefully the first award will be presented on this occasion.

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From the Cave Art of the Reindeer Hunters to the Rock Art of the Kangaroo Hunters*

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Abstract

Most researchers studying rock art throughout the world, both "new archaeologists" as well as "traditional" ones, have all rejected ethnographic parallels the way they were used at the turn of the century. The internal analysis of the evidence, as proposed twenty-five years ago by A. Laming-Emperaire and A. Leroi-Gourhan, is an universal method which has been progressively improved in recent years. It is based on two complementary processes: recording of art, the equivalent of an excavation and statistical analysis. Internal analysis can, however, still benefit by having light cast on it from outside sources. The ethnographic, archaeological and aesthetic comparison of these two independent but partly contemporaneous entities, the rock art of the kangaroo hunters and the cave art of reindeer hunters demonstrate not laws but general principles of human symbolic behaviour. They reveal universality, a certain continuity in the artistic creations of the hunter-gatherer societies as well as significant differences. It is important to know all these because the art of the Australians tell us something about the art of our own origins, even through their differences, and vice versa. This approach is in keeping with a major trend in present-day historical research, that of a 'comparative history', a search for similarities and differences in time and space.

The Rejection of Comparison

Leroi-Gourhan summarised his opinion on this point in 1969: "Rather than try, with an imagination that is inevitably outstripped by the facts, to embellish the strange totemism of the Australians, Eskimo, Bushmen or Fuegians, isn't it better to accept directly from Palaeolithic people the information that they volunteer"? (1969: 203).

Leroi-Gourhan's rejection of comparison has a double basis:

Comparison proceeds by analogy; it implies abandoning the evidence being studied in favour of seeking its meaning elsewhere, whereas only the in-depth analysis of the evidence itself can provide the elements of an interpretation.

The second reason is a lack of confidence in ethnological data. He stresses their variations and relativity: "Efforts

to understand Palaeolithic art have always been guided by what the present-day primitive world, filtered through western thought, could inspire" (1960: 281). Hence the double handicap of the "filter" and the chronological difference between the two terms of comparison condemn such a method.

Following Leroi-Gourhan, and Laming-Emperaire who also declared in 1961 that we should "substitute the internal study of the evidence for its comparison with ethnographic facts" (1961: 12), most researchers have abandoned not only ethnographic comparison but also any form of comparison at all. Convinced that the truth lies entirely and uniquely in the facts, they have carried out a fruitful return to the evidence, one that has inspired all research on prehistoric art around the world.

For more than 20 years the American "New Archeology" has been defining several methods of the archaeologi-

* The article is an expanded and updated version of *De L'Art Pariétal des Chasseurs de Rennes à L'Art Rupestre des Chasseurs de Kangourous*, published in *L'Anthropologie* [92 (1), 1988: 271-316]. The English translation is published with the kind permission of *L'Anthropologie*.

cal use of ethnological data. Inspired by Lewis Binford, many researchers with the advantage of a double training as anthropologists and archaeologists are adherents of ethnoarchaeology.

Richard Gould (1980), who has worked in Australia, published an interesting study titled, "Living Archaeology", showing how certain archaeologists study present-day primitive societies with the mentality and techniques of archaeology in order firstly to grasp the general relationship between human activities and the traces they leave in the ground, and then to be able to apply this knowledge and this model to the interpretation of prehistoric remains.

His profound ethnological knowledge and his sojourns among inhabitants of the Australian western and central deserts have guided his research and provided him with a particularly vivid interpretation of his excavations in the rock-shelters of Punturjarpa and James Range.

Betty Mehan spent more than a year in a tribe of shell-collectors in Arnhem Land, and her thesis (1982) is extraordinarily useful for understanding data from excavations of Australian shell middens, the earliest of which are about 7000 years old.

Unfortunately, it is easier to penetrate the everyday material life of present-day primitive societies than their sacred and religious activities. It is also unfortunate that these societies, disturbed by colonisation, have almost all abandoned the tradition of rock art. In this domain, therefore, we can no longer practise "living archaeology" as defined by Gould.

It is no doubt for this reason that the most recent of the "new archaeologists" Conkey (1979, 1983, 1984), Gamble (1980) and others who take an interest in Palaeolithic art have, in their turn, vigorously criticised ethnographic comparison.

The global criticisms of Margaret Conkey, for example, can be summarised as three points:

- 1) *Decontextualization*: when Breuil compares a New Guinea sorcerer covered in a straw costume with certain tectiforms or comet-signs of the Upper Palaeolithic, he completely ignores their contexts (Breuil 1952: 146, Fig. 111). Conkey even thinks that Leroi-Gourhan pays too little attention to Palaeolithic art's context, and that he is interested in the images while forgetting what surrounds them; but that is another problem.
- 2) *Presentism*: the theories founded on comparisons imply a certain contraction of time, an ahistorical perspective since comparison brings together a Palaeolithic society and a present-day society; the phenomena of the past are seen in an abstract relationship with analogous phenomena in the present.
- 3) *Homogenization*: interpretations based on comparison have set up "a homogenized, utopian view of (Upper

Palaeolithic) hunter-gatherers, so that they are seen as a prehistoric extension of the ethnographic present" (in Isaac's terminology (1976), as a "slice of ethnography").

Not only is Upper Palaeolithic art seen as a "unitary phenomenon" with a single artistic tradition persisting through the millennia, but present-day hunting societies are themselves seen as having homogeneous preoccupations with the crucial importance of hunting linked to the precariousness of their lives. According to Conkey (1984) the ecological parameters in the behaviour of hunters have been exaggerated at the expense of social parameters. But ecology is far from being able to explain the whole of the behaviour of primitive societies. This author concludes that "the result (of all these theories) has been a homogenized, utopian picture of the Upper Palaeolithic as a time when art and symbolism flourished. We have found ourselves in this past by depicting the Upper Palaeolithic as a decontextualized analog of ethnographic hunter-gatherers who are viewed as being ecologically structured, socially amorphous and well adapted" (Conkey 1984: 270).

It is interesting to note that the study of rock art has evolved in the same way in Australia.

Until around 1969-70, all studies of the parietal figures in this part of the world were considered the domain of anthropology. Knowledge of the myths, rites and social structure of the local Aboriginal communities enabled scholars such as Charles Mountford, for example, to interpret the engravings and paintings they saw with no consideration as to their age. So all these authors were in a sense practising "ethnoarchaeology" before the term was coined.

The International Congress organised at Canberra in 1974 by P.J. Ucko and the Australian Institute of Aboriginal Studies therefore marked a decisive turning point in the study of rock art, not only in Australia but also in other parts of the world. In the introduction to the volume published after this Congress, Ucko shows that the ethnological approach, although important and necessary wherever possible, is in no way exclusive. The purely morphological analysis of art finds justification in the fact that it reveals data "which would not have been consciously apprehended by practitioners of the culture(s) concerned", whatever their degree of traditional knowledge: evolution of styles and forms, complexity of certain iconographic systems which are inherited by generations and individuals without knowing their origins or their geographical and historic boundaries (Ucko 1977: 12-17).

After the stimulating Canberra Congress, and once the fact was established that Australian art began many millennia ago, some scholars such as Lesley Maynard and John Clegg broke with this tradition. They opened up a new path, that of a truly archaeological study of rock art by rejecting comparisons and ethnological data. The archaeological method had some difficulty being accepted.

In her thesis, "An Archaeological Approach to the Study of Australian Rock Art", Maynard remarks that "Australian rock art comes in varying degrees of prehistoric. Ethnographic studies which correlate various forms of art, myths and belief, rituals, and the social structure of those aboriginal communities which still practise these as a coherent whole, are, therefore, possible and desirable in northwestern and central Australia. Over most of the continent, where studies of this type are not possible, archaeological methods must be applied in order to derive any information from the many concentrations of prehistoric rock art. The techniques of analysis which the art prehistorian applies to this material are essentially the same as those which any archaeologist uses to organise prehistoric artifacts into intelligible patterns which yield information about their owners' culture — typological studies, absolute and relative dating, distribution studies, etc..." (Maynard 1976: 43).

So after this it was out of the question to practise a "prehistoric anthropology of art", that is, to speculate about its religious (or other) role in past cultures. Clegg, following Maynard, confirmed that "the aim became to develop techniques which will make prehistoric art of greater use to prehistorians. The ideal would be to make the art just as useful as any other set of artefacts — shell mounds, house remains, stone tools, or kitchen refuse" (Clegg 1978: 24).

The parallels in the evolution of research in Australia and Europe are striking, since it was in 1965 that Leroi-Gourhan also rejected ethnographic comparison and sought the building-blocks of interpretation in the evidence itself.

The archaeological approach to art is well established in Australia today. A dozen scholars have definitively adopted this method, and excavation has continued to reveal the antiquity of certain works of rock art. Although the archaeologist may not refuse the help of certain ethnographic data, nevertheless the study of the actual evidence still remains widely predominant.

Internal Analysis of the Evidence

Throughout the world, almost all present-day scholars studying prehistoric art on rocks mainly carry out an "internal analysis of the evidence" as instituted twenty-five years ago by Laming-Emperaire and Leroi-Gourhan.

This notion has considerably evolved through the years. In theory it comprises any analysis which does not call in outside data and which limits itself to the material remains available to the archaeologist, that is to say, first and foremost, the parietal figures.

It is worth recalling that the method was defined as a reaction against the works of Breuil. These certainly contained a large measure of "internal analysis", since they consisted especially of parietal tracings, but his interpretations based on comparison broke away from the data.

Laming-Emperaire and Leroi-Gourhan denounced this abandoning of the evidence, turned their efforts towards the search for meaning (which they considered primordial) rather than chronology (which was Breuil's major interest), and expanded the field of investigation of the art prehistorian. They showed that recordings of figures could tell us more, and different things, than Breuil had asked of them.

By advocating a return to the evidence and declaring that only the figures themselves contain the answers to the researcher's questions, they were the instigators of the current method of studying parietal art, a method that practises a more systematic, more in-depth and even broader internal analysis of the evidence than they themselves carried out.

The evidence to be analysed has indeed expanded. Leroi-Gourhan and Laming-Emperaire concentrated on their syntheses, carried out no parietal recording themselves, and made a special study of assemblages of figures. They defined the organisational structures. Today, researchers are trying to perceive the whole ensemble of the site. The study of the works' context, a context that becomes increasingly vast, has acquired crucial importance. Not only has the notion of a decorated wall asserted itself — figures have become inseparable from their support — but the whole of the cave is now studied to obtain some idea of its utilisation by Palaeolithic people, in the hope of finding traces of the rituals and ceremonies that took place in front of the walls. In revealing the role played by topography in the organisation of the decoration, Leroi-Gourhan had proposed a synthetic view of the sanctuary, but his conception of underground space was still theoretical. Under the influence of the considerable boom in studies of conservation of parietal works, the cave on the other hand has become a living and original environment that has acquired a whole personality.

Just as in the field of tool industries, typology and quantitative analysis are no longer sufficient for the study of figures, similarly, in the field of parietal art, what one might call, "functional analysis and usewear", reveal the traces of use of the figures, the walls and the cave, and are now extending to the study of the motifs, while experimentation has also appeared on the scene.

Out of all the work now underway, a new image of cave art is emerging little by little, that of an art of patches and traces as much as of elaborate works.

In 1977, Ucko remarked that "Palaeolithic art is not exclusively an animal art at all but is just as much a geometric art or a non-representational art" (1977: 9).

Whole fields that had hitherto been unknown now open up to investigation: it is no longer the syntax of the parietal graphic text that holds the attention but also, as shown by Conkey, the very construction of the "words", that is the motifs, and their internal structure.

The means to this "internal analysis", which never ceases to bring us more and more varied and numerous data, are above all parietal tracings extended by statistical studies.

Although there has been some exaggerated carping these past few years about their supposed "subjectivity", tracings have benefited from a variety of technical advances (in the fields of photography, lighting, graphic supports, etc.). They have attained a degree of precision that they had never known before. They have become the basis of all studies of parietal art, the indispensable acquisition of data, equivalent to excavation, without which any fantasy could be let loose. Unrecorded figures are unexcavated remains (Lorblanchet 1984).

N.W.G. Macintosh's Experiment

The current method of studying parietal art, based on an "internal analysis of evidence", is therefore fruitful. For that reason, it is also universal. However, ethnographic comparison teaches us that it is not infallible.

In 1949 and 1952, N.W.G. Macintosh, an eminent Australian anthropologist and archaeologist, having recorded the rock paintings of two shelters in the Northern Territory: Beswick Cave and Tindandjal, published studies (1949, 1952) based on an in-depth analysis of the figures, guided by his perfect knowledge of the local Aboriginal art and the scientific publications concerning it. Some of these motifs appear ancient. Several years later, local Aboriginal painters revealed to him and to Professor A.P. Elkin the real, complete meaning of these two decorated shelters which still played an important role in their traditions and rituals.

In 1977, in a second article, that is both honest and courageous, Macintosh compared his previous interpretation with the true meaning revealed by the Aborigines. The result is surprising!

Despite the figurative realism of the two sites, 90% of the recorded motifs, including figures that are quite clear, had been incorrectly interpreted by the researcher. For example, a wallaby had been confused with a melon, women with lizards, female figures with male. He had made no distinction between representations of spirits, divinities and ordinary individuals. The organisation of the decorated walls had completely escaped him: works located several metres apart, and separated by unrelated figures, were in fact associated and illustrated the same myths. The variety and complexity of the meanings had not been glimpsed: certain local animals and plants were depicted in a kind of inventory that underlined the region's natural produce; some of the painted hand prints or stencils were the signatures of known individuals, some were commemorative images, others simple games. The Aborigines gave him the exact meaning of each one. There were also figures of spirits of the dead, and many motifs were ritual and mythological illustrations.

Moreover, spontaneous movements of population had occurred since the arrival of white people, and the decorated shelters had been used in different ways in the course of their successive re-occupation by different groups. Certain myths had been replaced by others. The two sites had recorded these movements and hence presented an iconographic complex that only the Aborigines who were fully initiated into all aspects of their own culture could disentangle.

Macintosh's conclusion (quoting Elkin) is as follows: "Efforts by non-Aboriginal interpreters may provide interesting logical and consistent theory, but that is an approach through their own schematisation which is in danger of providing interpretations of their own concepts" (Macintosh 1977).

This unique experiment comprises numerous lessons which we would do well to ponder. Some of them are considered below, however, from the methodological point of view, it sets firm limits on the "internal analysis of evidence" (1977).

It exposes a certain positivist illusion that is implicitly contained in the idea that the keys to interpretation are **all to be found only in the evidence being studied, and that depth of analysis alone guarantees access to meaning**. Might it not be presumptuous to think that we can "accept directly from Palaeolithic people the information they spontaneously volunteer", as Leroi-Gourhan declared and many others have believed? Whatever the precision of our investigation, we are forced to recognise that our attempt to communicate, our relationship with palaeolithic people, can be neither "direct" nor "spontaneous". It requires effort, first and foremost: the long and minute work of deciphering and recording (the data are not immediate in any branch of archaeology); it can then be misleading, as Macintosh's experiment showed, into a projection of the researcher's mentality and culture onto the evidence being studied; and, in the long run, it is incapable of providing us with the deep meaning of prehistoric images. In rejecting comparison and the "filter of western thought" that distorts information derived from primitive societies, archaeologists — lured by their isolation and independence — are nevertheless caught in the trap of their own mentality.

Internal analysis and comparisons undoubtedly contain equal risks: both of them present limits of which we should be clearly aware. It is, of course, out of the question to reject "internal analysis", a fruitful method because its evidence definitely has "something to say". It is absolutely necessary to know that comprehension of this evidence can benefit from having light judiciously shed on it from outside, that evidence will not tell us **everything** because it does not contain the whole truth, and that it is even dangerous to want to "make it talk" too much.

In fact, it is perhaps right to wonder, in the light of

Macintosh's experiment, whether internal analysis does not contain a threshold beyond which research turns in on itself and pointlessly wears itself out while losing sight of its initial aims?

So ethnographic comparison teaches us prudence... Prehistorians who discover the magnificence of the philosophies, mythologies and thoughts that underlie all artistic production among primitive peoples, cannot but be impressed by the richness of the world hidden behind the images. Instead of "dressing Palaeolithic people in the finery of the Australians" they first notice something useful and important: the poverty of the remains they are studying, and their silence. Comparison allows us to be sharply conscious of what has disappeared. It evokes a whole world of possibles, like a mirage, which helps one to feel more clearly the shipwreck of time.

The world glimpsed behind the Australian images is undoubtedly very different in its content from the symbolic world of the Reindeer Age. However, it teaches Palaeolithic specialists a few universal tendencies of the human mind, a few ideas that are both simple and general.

The impoverished archaeologist who today is left with just a few material clues, the wreckage of a drowned world, learns from comparison that in hunting societies rock art is not an isolated phenomenon. It teaches us the importance of its socio-cultural context, the diversity and dynamism of its meanings.

The Contexts of Art

Aboriginal art is a religious art rooted in complex beliefs that explain the world, the origin of life, tribal customs, the presence and abundance of natural resources.

During the "Dreamtime", the earth was not formed; it was just a vast flat plain where the great spirits rested or from which they rose up. They were known by the name of totemic ancestors, and took half-human half-animal forms: Kangaroo-Men, Snake-Men, Eagle-Men... These supernatural beings could also take on either an animal or a human form. The present-day people, animals and plants are the descendants of these original hybrid creatures which are their totems.

It is these great spirit-ancestors which shaped the landscape, the hills, caves and rivers. The survival of the spirits and the totemic associations weave an enduring link between the past and present. The existence and exploits of these Dreamtime heroes are retraced in a mythology that is as rich and poetic as that of the Greeks, and which is illustrated not only in rock art but also in a great variety of forms of artistic expression (music, dance, body-painting, bark-painting, art on the ground, portable art, etc.). Paintings and engravings are the means by which the power and essence of these spirits' lives are transmitted so that they can revive the

earth and ensure the fertility of all living creatures including human beings.

R. and C. Berndt, taking stock of current ethnographic knowledge about the Aboriginal art that still exists or is just disappearing, remark that: "Traditionally, the tracks and pathways first made by the mythic beings were those over which Aborigines moved in their socio-economic pursuits. In their case, unlike the land over which the personages of the mythological era moved, the whole of the country was charted, and contained the named and identified physical creations of the Dreaming beings. The land, therefore, was dense with meaning — with song and story, and with their living spiritual representatives, manifested as features of that countryside. **Most Aboriginal art was, then, a statement concerning land:** not just any piece of land, but specific stretches of land substantiated through identified mythological associations" (Berndt 1982: 28).

Each Aborigine clan possesses a series of sacred sites, water sources, rocks and caves impregnated with the spiritual power of the Dreamtime heroes. Each of these sites, a cluster of which delimits a "clan's estate" is associated, according to Robert Layton (1985: 436), with "specific legends describing how they were created, specific songs and dances enacting these events and specific art motifs depicting the legendary heroes in human or animal form which appear in body decoration, on sacred objects and as rock art".

A site's importance, which sometimes surpasses that of the figures themselves, is also apparent to today's conservation specialists. "Aboriginal people are mainly concerned with preserving the meaning and/or integrity of sites in their cultural setting. Paintings and engravings are perceived as part of a greater whole. Art, rock and locale are not separable concepts. The common European emphasis on art over locale is a distortion of the value which its Aboriginal owners place on rock art. The removal of threatened rock art to museums or other safe locations is therefore often not acceptable to Aboriginal people" (Rosenfeld 1985: 8).

Although the mythological connections of the reindeer hunters with their environment were probably very strong, we do not know to what degree Palaeolithic art could likewise be "a statement concerning land" in the terminology of R. and C. Berndt. This feature of Aboriginal art, however, helps us to grasp better the importance of parietal art's topographic and geographic context. Its spatial integration, its relationship with its natural environment are included in present-day research. Figures are no longer considered in isolation but in their connection with the shapes of the wall, and with the topography of the caves which has taken on a new reality. This avenue of research is certainly fruitful, and can no doubt lead us even farther.

Vialou asked himself the fundamental question as to "whether cave architecture, which we know to be extremely

variable, determined differing symbolic orientations or did the Magdalenians sometimes impose, to some extent at least, in a comparable way, a certain type of symbolic construction" (Vialou 1981: 33). The dialogue between the artist and the cave is indeed fascinating. One might also wonder why, in regions where caves abound, some were decorated and others were not; what were the criteria of Palaeolithic choice? What spelaeological knowledge did they have in this period, or simply what precise knowledge did they have of the local natural environment?

Take Pech Merle, for example, in a dominant position on the region's highest peak, and the Quercy's most important sanctuary through the number and size of its panels. It is surrounded by about ten little decorated sites in a radius of a few kilometres, located in smaller caves which are lower down, along rivers. Pech Merle is the region's biggest cave and is located in a zone which contains about a hundred others of various sizes, most of which are little known. Did the big cave create the great sanctuary? Or did the great sanctuary choose the biggest cave? Is there a hierarchy of decorated localities, with a chief site surrounded by satellites? Was there any relationship among these caves whose decoration is undoubtedly not all contemporaneous?

All these questions have not been asked before because they require a sum of knowledge that it takes a long time to acquire. Firstly, a perfect knowledge of the content of all these sanctuaries and of their precise dating. Secondly, within the zone in question, which is not exactly enormous — about 50 sq km — and which may thus have been frequented by the same group of people, the excavation of associated habitation sites; and finally, the spelaeological exploration of all the caves, whether decorated or not.

The fact that parietal art is art 'in place', and that works are still where they were originally, is less misleading in Australia, where the natural environment has often been more stable than in Europe where the walls have not always been preserved and where caves and landscapes have evolved considerably since the last glaciation. Caves are living places; so we often don't see the works from the same point of view and the same place as their authors did. The reconstruction of the natural setting of the reindeer hunters demands in-depth research.

Nevertheless, Anne and Michael Eastham (1979) have proposed the hypothesis that the art of the French and Spanish caves reproduced the layout of the terrain in front of the cave entrances, the relief having controlled the movements of game and therefore played a crucial role in the daily life of these hunters. They tried to compare the distribution of the figures inside the galleries with the design of the valleys and mountains and all the exterior topography. Although they have not proved their case, these bold views, which are actually very far from accounting for the obvious complexity and variety of Palaeolithic parietal art, are nevertheless in keeping with an interesting trend of current

research, that of stressing the importance of the topographic environment. The same is true of Bahn's efforts (1978), in putting forward the existence of a relationship between Pyrenean parietal art and thermal springs. To take an even more general view, how does one explain the clustering of parietal art in such a small part of Europe and not in another? All of these questions still require elucidation.

Australia's rock art also helps us to grasp the importance of the **social context** in artistic creation.

In Aboriginal mythology, each spirit is responsible for particular human beings. All people conceived or born in the precise spot where a mythological event took place during the Dreamtime are spiritually associated with the perpetrator of that event. They are one of his manifestations. Moreover, since each origins-hero has also been transformed into an animal or creature that now symbolises him, there is an intimate association between that creature and the individual(s) concerned.

According to R.M. and C.H. Berndt (1982: 29), "Through this procedure, the mythic and natural worlds are regularized and brought within the social world of people. Or we can view it as a procedure through which people are incorporated into nature and into myth". The two Australian ethnologists note that "everything that is the concern of man is patterned in social terms".

Although Aboriginal society has no professional artists, and although theoretically all males possess the privilege of painting or engraving, artistic production is controlled by a complex set of rules that are entirely defined by each individual's mythological association. Hence, since the Dreamtime, rules have been established about the rights and ownership concerning the motifs that can be depicted, the pigments or techniques to use, the parts of myths that must be illustrated, the accompanying rites to carry out, the places and sites to paint where the mythical events took place that concern each man and each human group in particular.

This social deep-rootedness of art, as presented to us so clearly by the first Australians, can only encourage European Palaeolithic specialists in their current search for provinces and local identities. Reacting against all the previous monolithic systems of interpretation from 'hunting magic' to the 'art-Mythogram' — Conkey is trying to understand Palaeolithic art by setting it in its more illuminating socio-geographical context. She advocates "archaeological analysis of stylistic discontinuities" which must be seen as "indicators of social boundaries" (Conkey 1982: 116). In this way she attempts to regionalise the study of art, define small territorial units by basing herself on the analysis of mobiliary and parietal figures and on local archaeological data. Her study of the graphic structures of the portable art of the Cantabrian region enabled her to isolate about 15 basic elements, the combinations and geographical distributions of which brought new information for the identification of

social groups, the sites they used, and their relationships. She was able to put forward the convincing hypothesis that the cave of Altamira was a centre of great seasonal gatherings (Conkey 1980).

This direction of research fits perfectly with that currently being used in certain studies of portable or parietal art in Perigord, Ardèche, Quercy or in "Magdalenian Ariège", the subject of Vialou's thesis (1981).

This approach was opened up in France by Leroi-Gourhan himself when, in 1978, he established that "signs were ethnic markers" (Leroi-Gourhan 1978). Moreover, the notion of "ethnic marker" can be extended because, like signs, the animal species depicted, their styles, respective frequencies, their associations, the ways caves were used, and other data concerning mobiliary art or industries, can all contribute to characterising an Upper Palaeolithic human geography which looks extremely promising and fascinating.

In this way, bit by bit, we shall cut down that great block that Palaeolithic parietal art still constitutes, since it is too often considered a homogeneous whole. Little by little we shall distinguish the cells, the units of time and space, that it comprises. Thanks to the imprint that human groups left in their graphic material, we shall even manage to detect the mark of individual artists on their works.

It certainly appears that each maker of images in each cave employed a set of precise conventions, a series of segmentary motifs ready for use, dictated as much by local conventions as by the Palaeolithic constants that were widespread in Europe and through the millennia of the Reindeer Age. The way in which the artists combined these elements enabled them to put a personal imprint on their creations.

Hence, the animal figures of Ebbou are variations on a single model, a standard form with a vertical chest, a raised neck, legs drawn as an X, to which it was simply necessary to add a few characteristic extras — horns, antlers or tail, themselves very standardised — to obtain either a horse, an ox, a red deer or an ibex. The uniformity of the process, quite different to what can be seen in other caves, and accentuated still further by the standardised technique and the late intrusion of two figures in a totally foreign style, argues strongly for almost all the cave's engravings having been done by the same hand (Fig. 1).

Many other examples could be presented. At Pech Merle the author was able to identify a Magdalenian 'Master of the Black Frieze', who produced 45 black drawings in different parts of the cave (Lorblanchet 1981). Barrière (1983) showed that the whole of the great ceiling of Rouffignac was the work of one artist. In the Spanish Basque country, Apellaniz (1982) has managed to distinguish the work of several painters, and even to isolate what he has called the "Ramales school".

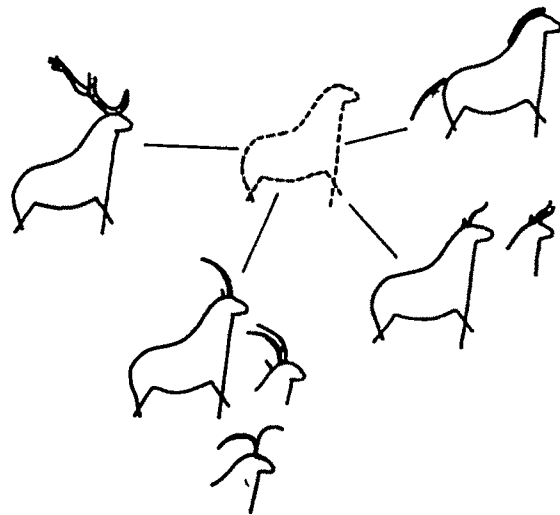


Fig. 1: Construction of engraved animal representations from Ebbou Cave (Ardèche). In the centre, the standard shape.

Despite its difficulties and occasional uncertainties, this approach is extremely useful. It should be applied systematically, especially at Lascaux. Through intensive graphic analysis, it tries to differentiate clearly the collective graphic conventions of a particular group or period from the style of an individual draughtsperson or painter. It can help us to find out if some sanctuary was an "instantaneous" and homogeneous project or if it was the result of successive episodes, and if several neighbouring caves contain works by the same artist and are therefore contemporaneous. It therefore leads us into such general problems as chronology, the composition of decorated ensembles, the use of sanctuaries and the social function of the creators of parietal images.

Of course, this search for a personal touch in the technique and graphism of depicting figures in no way belies art's social conditioning. In Australia "although it was crucial everywhere for any production to be socially acceptable, a certain amount of individual treatment was socially acceptable too" (Berndt 1982: 29).

In the search for meaning, Aboriginal rock art also provides some useful information. It tells us that, in Australia, meanings have three characteristics: **diversity**, **overlaps** and **fluidity**.

Meanings

Ucko and Rosenfeld showed that "Australians paint and engrave on rock walls for many different purposes" (1967: 160). Indeed, hunting magic, fertility magic associated with totemism, illustration of myths — sometimes to teach them to beginners, art's didactic role — destruction or love magic, all of these are among the most common motivations of Aboriginal rock art, as has been explained successively by all the ethnologists to have worked on this continent since Spencer and Gillen. But there are also more gratuitous

works, depictions of legendary heroes or narrative figures commemorating events in daily life (see for example McCarthy 1967). In the centre and north of Australia, a diffuse sexual symbolism is also combined with many other meanings.

Macintosh (1977) clearly showed, for example, as we saw above, the inextricable mixture of commemorative, symbolic, and mythological figures, or simply figures done in play, that was contained in the shelters of Beswick and Tindandjal.

It is important to note that these diverse meanings often overlap. Figures with a single precise meaning are no doubt less numerous than those with multiple meanings.

The seasonal retouching of Wandjina paintings in the rock-shelters of Kimberly (north-west), for example, is motivated, according to Elkin (1930: 20), both by totemic ritual and, at the same time, by fertility magic, hunting magic and sometimes destruction magic, the invocation of rain, protection of the dead, and, through hand stencils, the desire to keep count, to record every visit to the sacred site.

The meanings of the kangaroo hunters' art are not merely diverse or overlapping, but also change. Their **fluidity** is revealed in two complementary ways: through the symbols' semantic plasticity and the chronological dynamism of the meanings.

The same motif can have a series of different meanings depending on the context in which it is used. Nancy Munn (1973) distinguishes two types of motifs in the art of the central and northern regions: symbols with "continuous or condensed" meaning, that is, whose meaning remains unchanged no matter what their context, and symbols with an assortment of "discontinuous" meanings which are modified according to context. The tribes of the Centre, especially the Walbiri, possess an iconographic system made up of elementary signs used in various activities: sand drawings to punctuate the tales of the storytellers, body paintings, decoration of Tchuringas, rock paintings. These signs, graphically derived from the circle and line, have a sexual connotation, the circle being a feminine symbol and the line a male symbol.

For instance, the circle may represent an Aboriginal camp, a water hole, a woman's breast, a dingo paw-print, a knee-imprint on sand, etc. Parallel arcs are windbreaks to protect the camp, men lying on the ground, boomerangs, etc. The line expresses movement: it also represents a path or itinerary, but sometimes also a wooden post, a tree, etc. The art is a visual language. The sign does not contain the meaning, it is part of a system that gives it meaning. Its simplicity assures it of a high degree of repetition and a great semantic plasticity (Fig. 2).

Munn concludes: "In sum, verbal forms often elicit graphic ones, while graphic forms in turn elicit verbal



Fig. 2: Some elements of Walbiri iconography, Middle Australia (after Munn 1973):

- 1 to 4: Elements with a "continuous" significance: 1= snake, 2= tree, 3= human, 4= hill.
5 to 9: Elements with a "discontinuous" series of significance: 5 (female symbol)= circular path, hole, water hole, camp fire, fruit, hill, breast, etc. 6 (male symbol)= straight path, kangaroo tail, spear, post, tree, spine, man lying down or dead, etc. 7= meander, snake, lightning, smoke, etc. 8= cave, hut, shelter, rainbow, etc. 9= seated man or woman, sometimes a standing man.
10 to 12: Examples of combined signs: 10= man (U) throwing his spear (-) at a kangaroo () lying under the trees (festoon design). 11= stream-bed (O) with water hole (O), with trees (OOO) and a sitting woman with her water shovel. 12= a flock of emus (footprints) has come near the site. The drawing, made of circles and lines, shows the movement of the emus around the site. Each circle is a camp fire.

communication (songs or prose). Indeed, Walbiri notions that both songs and designs are transmitted in the one *yawalyu* dream, and that the painting of designs in ritual contexts should be accompanied by the singing of relevant songs, symbolically express these close ties between verbal and graphic communication" (Munn 1973: 99).

Another example of sexual symbolism was described by Reser (1977) in his study of depictions of dwellings in Arnhem Land bark paintings.

In these paintings the houses are reduced to two basic pieces of their framework, depicted separately and not in their functional position: the vertical forked post and the simple horizontal crosspole. Post and crosspole symbolise the whole dwelling. They are multipurpose symbols: the forked post represents a feminine principle, vagina or uterus, but also, as shown by associated myths, a snake's tongue, a

fish-trap, a coffin, a digging-stick... the forked post possesses a further double symbolism: the fork where the crosspole rests is feminine and the shaft is masculine.

The crosspole is both a phallic symbol, a python, a totemic trumpet, a fighting stick, a javelin, a club, a tree, etc. Post and pole in their functional position symbolise copulation and the idea of being enclosed and protected.

The fluidity of meanings is also a chronological notion. One of Australian art's characteristics is the contrast between the permanence of forms through time and the dynamism of meanings.

For millennia, this open-air art remained accessible to successive generations who used it in different ways. Certain works must have preserved their original importance for a long time whereas some old motifs were freely reused. Their modifications in the course of successive reutilisation reveal an evolution or a complete change in their meaning, the pre-existing 'container' constituted by the figure's outline being put back into service and adapted to receive a new 'content'.

During the author's recording of engravings at Dampier (Western Australia) it was observed that the extraordinary half-animal half-human creatures, with elaborate appendages and accessories gradually lost their original distinctive features. They were made more banal in the course of time, and reduced to the commonest types of human figure (Fig. 3) (Lorblanchet 1980).

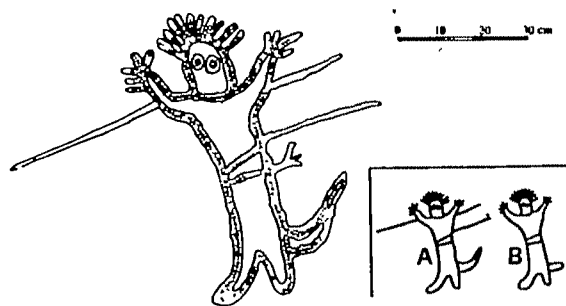


Fig. 3: Example of renewed engraving: entrance of Gum Tree valley (Dampier, Western Australia).

A= first stage of the engraving: speared human representation with a kangaroo's tail.

B= final stage of the engraving: simple traditional male representation, without spear — the tail has been changed into a leg (tracing by M. Lorblanchet).

The myths which are illustrated by many engravings or paintings evolve, follow one another and are superimposed just as the lines are superimposed on the rock. Crawford (1978: 117) showed how "the mechanism of dreaming and revelation permitted Aboriginal society in Kimberly a great degree of flexibility... communication by dreaming allowed new events to be incorporated into the mythologies".

Through its semantic diversity, flexibility and dynamism, the kangaroo hunters' art once again teaches the Palaeolithic specialist to be careful and extremely suspicious of all dogmatic systems of interpretation. It can even lead us to doubt the very validity of a search for meaning. Like Macintosh's experiment it provides further evidence that precise knowledge of meanings lies outside the domain of the archaeology of prehistoric art, which must rest modestly content with perceiving **structures** rather than with the meaning of the figures it studies.

Ucko and Rosenfeld concluded their book on "Palaeolithic Cave Art" by remarking that "there is nothing against assuming that Palaeolithic art, as is also the art of many living 'primitives', is the result of many different interests" (Ucko and Rosenfeld 1967: 239).

Is the very dynamism of meanings more obvious in Australia than in the European decorated caves? Is there a contrast between a secret cave art whose semantic structure lasted a long time, as Leroi-Gourhan claimed, and an open-air art, accessible to all, which was continually modified and reutilised?

It was in the course of recording engravings at Dampier that the author perceived with the greatest clarity the general problem concerning the use of decorated walls through time. It was because on account of having observed the phenomenon on Australian figures that certain parietal drawings in Quercy were also discovered to have been renewed.

In Pech Merle's Combel gallery, the panel of the feline and horses, drawn in red ochre, had had a brown hook-shaped sign painted on top which cut into the central horse's back. With the same pigment, which was darker than the ochre on the underlying figures, the contours of a horse and the feline were partially touched up. This pigment is identical to the one used during the second production phase of the antelope panel at the end of Combel. This panel was produced in at least two successive episodes: a cervid, perhaps a female *Megaloceros* was first drawn in red; then it was redrawn in brown and transformed into that fantastic creature that the Abbé Lemozi christened 'antelope'. Two other brown 'antelopes' were added to the left of the first. It is not impossible that in this case, as on certain Australian walls, the modification of the lines during reutilisation denotes a change in the figure's meaning.

In the cave of Cougnac (Lot), the author's recordings have revealed two successive phases of production of the *Megaloceros* frieze. On a wall over 15 metres long there first appeared a series of red drawings, notably two *Megaloceros*, three ibex and a collection of diffuse traces produced by rubbing with the hand. Then a series of black drawings was superimposed on the earlier motifs: one of the great *Megaloceros* was gone over again, and a female *Megaloceros* was added between the two males. Other motifs, such as a wounded anthropomorph and a collection of dot-signs,

especially pairs of finger-dots, later than the original red phase, seem to belong to the black phase.

It is noteworthy that Cougnac's two phases of drawings correspond to different signs. At the beginning, simple diffuse marks; then truly organised dots, made with finger-prints. Prints or patches surrounding the figures may be traces of use of the decorated walls during the rituals carried out in the cave (Lorblanchet 1984).

One of the characteristics that parietal art shares with portable art is the presence of **multiple outlines** on some animal figures, that is, the existence of several legs, muzzles or tails. This seems to be a cultural phenomenon since their distribution through time and space is relatively restricted. In the domain of parietal art they are chiefly found in the Aquitano-Pyrenean Magdalenian for example, at Sainte-Eulalie, Les Trois-Frères, Les Combarelles, Lascaux, Teyjat, etc. The little engraved ibex of Le Colombier (Ardèche) have multiple legs and support the hypothesis of a western influence in the Rhone basin in the middle and upper Magdalenian.

The interpretation of multiple outlines is difficult because they are only found on specific figures and not on collections of them, they only concern anatomical parts — more or less always the same ones — and they are mostly engravings whose superimposition is harder to decipher than that of different pigments as described above. Is it a depiction of movement? This is undoubtedly the case for quite a few figures such as certain reindeer at Sainte-Eulalie. Could it be a renewal of the lines? A ritual upkeep of the figure during a fairly brief timespan? Or, as Aboriginal art reveals, could it be a bringing back into service of traditional figures by generations which knew nothing about each other, and whose beliefs had sometimes evolved? (Lorblanchet 1972; 1986). Although too systematic and not always well demonstrated, Marshack's theories on "cyclical notations" are interesting because they emphasise this graphic dynamism which had almost escaped the scholars of earlier generations (Marshack 1972).

It is possible that Palaeolithic art, being more structured and more secret than Australian art, lent itself less to successive retouching and reutilisation. Some masterly great compositions which are the work of a single artist (Pech Merle's Black Frieze, Rouffignac's ceiling) permitted no renewal.

And yet retouched figures exist in our European caves; but neither here nor in Australia does the reuse of figures imply a continuity in meaning. According to Horticq, who showed how images persist through civilisations, "artistic forms are like vases that generations pass on to fill with different liquids" (Hourtco 1927: 59).

Moreover, if you compare the main features of Australian art's meanings with the hypotheses concerning the meaning of the Reindeer Age's parietal art, it appears that all

interpretations of this art that have been successively presented since the turn of the century, whatever the method of study used, from art-for-art's-sake to magic, from totemism to sexual symbolism, can be found among the motivations of Aboriginal art.

It should be stressed that the discovery of sexual symbolism in Central and Northern Australia by Munn (1973) and Reser (1977) — a diffuse symbolism which is, moreover, combined with many other meanings — occurred after the publication of "Préhistoire de l'Art Occidental", that is, after 1965. The reduction of the signs' sexual connotation to two types (circle and line), their semantic versatility, and their complex combinations are extremely close to the system discovered by Leroi-Gourhan in his analysis of the reindeer hunters' symbols.

Rejecting all comparison, the internal analysis of Palaeolithic evidence thus leads to concepts familiar to the Walbiri, other Aboriginal groups and no doubt also to other peoples of the earth. It produces nothing new, nothing that could not have been derived from an ethnographic comparison.

This cannot be a simple chance coincidence. Perhaps the variety of systems of thought that underlies the artistic production of *Homo sapiens sapiens* in time and space is not, therefore, infinite.

In a talk at the University of Durham, and more recently in a published article, Layton (1983) compared Kimberley and Kakadu rock art on the one hand with that of South Africa and the European Upper Palaeolithic on the other, basing himself on the geographical distribution of the decorated sites and their figurative content.

He noticed that the painted shelters of Kimberley (north-west Australia) are quite regularly spaced, each of them occupying the centre of a tribal territory. This is primarily a totemic art. Each shelter displays polychrome figures of ancestral heroes, the Wandjina, associated with a few depictions of a totemic animal that differ from one shelter to another, since each clan possesses its own particular totem. The same iconographic structure is therefore found in all the shelters, but beside the same ancestral heroes are placed different animals, so that the whole of the region displays a great variety of them. So the Kimberleys' rock figures can be considered as the totemic emblems of social groups that are internally undifferentiated, and they assert that each of these groups has ownership of a particular domain.

These same shelters also contain smaller, dynamic monochrome figures, the "Bradshaw figures" which underlie the Wandjina and seem to correspond to a non-totemic cultural system, much earlier than the present-day system.

On the other hand, in northern Australia, along the great Arnhem Land escarpment, Layton reminds us that a

more or less continuous line of decorated shelters at the foot of the escarpment's cliffs display big polychrome X-ray figures of animals and birds, which simply seem to be faithful representations of all the species eaten by the Aborigines of the region. The geographical distribution, iconographic structure and themes depicted are different to what can be observed in the Kimberleys. Here, each shelter contains a great variety of species depicted, but the same species are found in all the shelters. This art seems linked to fertility magic and rituals for making species multiply.

The art of South Africa (Drakensberg), studied successively by Vinnicombe and Lewis-Williams, seems to have another meaning, since the Bushmen have no totemism. The painted shelters are organised in little groups, and the same human and animal themes are found everywhere; one animal species, the Eland, is dominant everywhere and is of primordial importance. These figures have no connection with hunting; they are related to the particular parallels that the Bushmen establish between animals and humans. The structure of the Eland herds is, in fact, seen as a reflection of the social structure of human groups. There are even half-animal half-human hybrid figures. Whereas in Aboriginal culture each clan has a unique relationship with a particular animal — or plant-totem, in Bushman culture every band maintains the same spiritual relationship with the same animals and the same spirits. Bushman art tries to show the interpersonal relationships between the members of the animal or human groups; so it is rich in complex compositions and scenes.

For Layton, the distribution of Palaeolithic decorated caves is meaningful. He shows that, on the Cantabrian coast, circles of 30 km diameter tend to define areas that each contain one important decorated cave and several small satellite caves. This distribution model, and the fact that, among the figures which are the same everywhere, two species, the horse and bison, are dominant, lead him to establish a parallel with the decorated shelters of South Africa in contrast with certain types of Australian art.

This scholar, like Conkey, also puts forward the idea that parietal art can help to define territorial units. Finally, the distribution of themes shows that in the Palaeolithic as in South Africa, parietal art is linked to a cosmogony (Layton 1983; 1985).

Comparisons of this kind are fascinating, and this direction of research will certainly prove fruitful.

In the case being discussed, the contrast between the Kimberleys art and that of the Drakensberg — which are more or less contemporary — is described perfectly; on the other hand, the references to Arnhem Land art and Palaeolithic art are not very convincing. Layton was perhaps right to take the comparison as far as he did, because research will one day achieve this kind of level. Unfortunately, in the present state of our knowledge, he could make his compari-

son only by oversimplifying, or "homogenizing" to use Conkey's term.

The decorated walls of the Kakadu region (Arnhem Land), found in some 10,000 painted shelters spread over a distance of 250 km, constitute what is undoubtedly the most important and spectacular rock art centre in the world (a total of about 300,000 sq m of decorated walls!), and they are far from being limited to a simple illustration of rituals to multiply the species eaten. George Chaloupka (1984) who has been studying and making an inventory of this extraordinarily rich and complex assemblage for more than twenty years, shows that some of these figures may be 30,000 years old.

Similarly, the 30 km diameter circles on the Cantabrian coast enclose caves whose figures accumulated in the course of more than ten millennia; and one should not forget the diversity and dynamism of meaning that was stressed earlier.

This particular type of comparison therefore demands extra information, that is, an extra 'internal analysis' comprising exhaustive site monographs, and complete recordings of certain decorated shelters. After a hundred years of research, we have these complete recordings of some sites with Palaeolithic parietal art, whereas they are quite exceptional in the whole of Australia where anthropological study of the art did not, in general, find them necessary, and where archaeological studies, strictly speaking, have only just begun. The complete recording of Australian decorated walls would enable us to carry out an in-depth analysis of their use over time, and to differentiate successive artistic phases; they would certainly reveal a great graphic complexity and would set anthropological interpretation within a chronological context that would give it, in a sense, some 'roots'. Faced with these great Australian ceilings, these vast surfaces decorated with a confusion of superimposed polychrome figures, the archaeologist realises the quantity of information lost through a strictly anthropological analysis which might consider it sufficient simply to obtain a 'reading' from the site's Aboriginal users.

In 1974 the author was present in Cape York at a reading and interpretation by Johnny Flinders, an initiated Aborigine from the region, of the painted ceiling of the shelter of Walaemini. The old man had perfect knowledge of his country's traditions, and provided explanations of what he interpreted as a turtle, whereas it was in fact at least three ancient superimposed human figures; this demonstrates how necessary it is to carry out an archaeological study of the assemblage.

So chronology is a crucial piece of data. Moreover, comparison and chronology can be mutually beneficial. They can contribute to a better presentation of the problems concerning the origins of art and the evolution of styles throughout the world.

Chronologies and Styles

The duration of Australian rock art is longer than that of Palaeolithic art, since it spans more than 30 millennia instead of 15, which is the equivalent in Europe of the duration of Ice Age art plus Spanish Levantine art. The chronology of these two partly contemporaneous and totally independent traditions not only permits but even invites comparison, in order to understand better both the universals of human thought and the distinctive original features of each of the assemblages.

In the two domains of art's appearance and its evolution, useful light can be shed through a comparison of the Palaeolithic and Australian worlds.

As far as we know at present, the origins of Australian art seem to be slightly more ancient than those of Palaeolithic parietal art, which occur in the Aurignacian around 27,000 or 28,000 years ago on some engraved blocks from shelters in the Les Eyzies region (Delluc 1982). However, amazingly high dates (around 40,000 years ago) have recently been obtained for Aurignacian levels containing some rudimentary mobiliary art, most notably in the porch of Castillo cave, Spain (Cabrera-Valdes and Bischoff 1989).

In the Gravettian around 24,000 years ago there occur the earliest decorated caves such as Pair-non-Pair or Gargas, whose engravings are older than the archaeological deposits sealing the entries of these caverns (Delluc 1985; Rousot 1985).

On the other hand, Thermoluminescence dates from Malakunja II and Malangangerr shelters located at the foot of the western escarpment of the Arnhem Land Plateau suggest the arrival of people in Northern Australia between 50,000 and 60,000 years ago (Roberts *et al.* 1990).

Cation-ratio dating of varnish covering the pecked rock engravings of the Karolita site in the Olary region (South Australia) recently provided a series of 24 minimum dates for animal tracks and geometric figures. These dates span a period from 31,600 to 1400 years B.P. They show an unchanged stylistic tradition and establish the fact that some of the Australian peckings are the oldest form of rock art in the world (Nobbs and Dorn 1985).

A few years earlier, a series of indirect minimum dates — also using age-measurements of patina (desert varnish) but with a more conventional method — had already been obtained by Dragovich for Panaramitee-style engravings at Sturts Meadows and Broken Hill in Southeast Australia (more than 5000 and 10,000 years, Dragovich 1984-1986).

The antiquity of the kangaroo hunters' art is confirmed in many other ways: for example, ochre fragments that reveal some kind of pictorial activity have been discovered in layers earlier than 30,000 B.P. at Lake Mungo.

The digital markings of Koonalda Cave (South Australia) have been dated by their archaeological context and by

carbon 14 to a phase earlier than 20,000 years ago (Wright 1971).

In the Early Man shelter in Cape York, Rosenfeld uncovered an engraved wall covered by archaeological levels dating to $15,450 \pm 1500$ B.P. (ANU-1567. Rosenfeld *et al.* 1981). In 1984, during the author's study of the Dampier sites (Western Australia) sea shells were discovered, dated by J. Evin to $18,510 \pm 260$ B.P., that were associated with an ancient stone industry and deeply patinated engravings (Lorblanchet 1988; 18 radiometric dates were obtained for this group of engraved sites). A few other engraving sites have been dated objectively by the archaeological or geological deposits covering them: Malanguine cave (5500 years, South Australia, Bendnari 1985); the Ingaladdi rock-shelters (Northern Territory, 5000 to 7000 years) and the Devon Downs rock-shelters (South Australia, 4000 years, Mulvaney).

Decisive progress has just been made in France and Australia through physico-chemical analysis and direct absolute dating of parietal pigments.

An Australian/Canadian team has achieved the exploit of detecting human and animal blood in the red pigments of Judds Cavern (Tasmania) and a rock-shelter in the Northern Territory (Laurie Creek). The team was then able to obtain a date using the particle accelerator on a quantity of carbon, extracted from the blood residues, of the order of 50 millionths of a gram! The two dates obtained for the red patches and hand stencils of Judds Cavern ($10,730 \pm 810$ and 9240 ± 820 B.P.) confirm the existence of a Pleistocene parietal art in Tasmania. The date produced by the Laurie Creek shelter in the North ($20,320 + 3100/-2300$ B.P.) constitutes the oldest absolute date for an Australian rock painting (Loy *et al.* 1990).

In France, in order to complete our recording of the paintings and the study of all the traces of use of Cougnac cave, collective studies have been carried out since 1985 of the parietal pigments, using Scanning Electron Microscope, X-ray diffraction and X-ray microanalysis. These analyses revealed that some drawings were done with pine charcoal, and allowed us to obtain the first direct absolute date of a parietal motif in Europe: a dot was dated to $14,300 \pm 180$ B.P. This result poses the general problem of the homogeneity of the Palaeolithic sanctuaries, a problem that can at last be tackled objectively thanks to current technical progress (Lorblanchet *et al.* 1990).

Moreover, the study of the parietal pigments of the cave of Miaux, and of Magdalenian painted objects from the cave of La Vache (Ariège) has revealed the existence of actual 'recipes' in the preparation of the paintings. These recipes seem to have some chronological value since they are dated by painted mobiliary art. They made it possible to assign Niaux's parietal figures to the middle and late Magdalenian, whereas traditionally they had only been

attributed to the middle Magdalenian. Here again, the artists' activities on the walls seem to stretch through a long period of time.

Direct AMS dating of parietal pigments continues to develop: recent measurements suggest a Pleistocene date for some of the art of the Sydney sandstone basin (Australia), which had been assumed to be Holocene in age. One of the dates produced by Gnathia Creek is $29,795 \pm 420$ B.P. and confirms once again the enormous antiquity of Australian rock art (McDonald *et al.* 1990).

In fact, at present 27 out of a total of 275 European sites with parietal art have absolute dates that place them with certainty in the Palaeolithic. So the proportion of objectively dated sites remains less than 10%.

In Australia less than 30 sites have been objectively dated, and barely a dozen of these are of fully guaranteed Pleistocene age. The percentage of dated Australian sites is still far smaller than that of Europe, but the gap between the studies carried out in this field in these two parts of the world is closing fast, and Australia has immense potential.

In other parts of the world, rock art also appears at equally early periods. In the Apollo 11 Cave, Namibia, plaques with animal figures painted on them were discovered by W.E. Wendt in an archaeological layer dated by radiocarbon to 26,000-28,000 B.P., that is, to a phase contemporaneous with the Perigord's engraved blocks.

In Brazil, at Boqueirão do Sitio da Pedra Furada, paintings have been dated to a period earlier than 23,000 B.P. (Guidon and Delibrias 1986: 770).

Dates and other convincing clues have recently revealed the existence of a fully Pleistocene or late Pleistocene parietal art in Tanzania, Libya, Tassili, Arabia, India and Argentina (Anati 1983-1989, and Lorblanchet *ed.*, 1988).

Hence, recent discoveries are establishing the existence of a Quaternary art in all continents, and the piling up of increasingly early dates is raising the hypothesis of a direct link between the emergence of art and that of *Homo sapiens sapiens*, with art appearing as the manifestation of humanity's fundamentally biological progress. This hypothesis has been opposed by the "Anglo-American school". As a reaction against all determinism of race or environment, and especially against the "ecological determinism" of traditional French and European prehistory which sees humankind as being too narrowly conditioned by its environment, this school systematically emphasises social phenomena.

For Binford (1972), the appearance of art was linked to an increasingly complex social geography. For Gamble (1980: 522), "the dramatic developments in material culture, such as the appearance of art, now seem to be more closely related to changes in the amount and kind of information needed by Palaeolithic societies, rather than dependent on

the evolution of the brain". These scholars, together with Pfeiffer or Conkey, have tried to show that the artists' preoccupations and capacities were in evidence long before the Upper Palaeolithic, and that the fluorescence of figurative image-making can be explained by the existence of "pressures... of both a social and cognitive nature" (Conkey 1978: 63).

However, one can't make the whole of Palaeolithic art spring from the Pech de l'Azé bone... or even from the marks on Mousterian ribs, or a few fossils or odd stones gleaned by Neanderthals, or from a love of rare materials or the perfection of functional forms. These are the first fruits which might lead to a collector or a good craftsman: but Palaeolithic people became artists. This discontinuity, this change in the nature of aesthetic preoccupations, is further accentuated by the appearance of art in new lands like Australia, Tasmania, Argentina, far from any "Neanderthal preparation", in virgin territories where "social geography" couldn't yet be as "complex" as in old Europe with its hundreds of millennia of dense population. On the world stage, art makes its appearance as an activity for pioneers. It accompanies the expansion of inhabited land. It's a complex phenomenon, as much biological as it is social or cultural, and impossible to reduce to just one of its constituents.

Leroi-Gourhan, whose chronological system is used by most Palaeolithic specialists — except for the followers of "New Archaeology" who tend to reject any chronology — distinguished four Palaeolithic styles which are like successive landscapes in a single journey. They are linked together quite harmoniously although there may be a few slight overlaps in space and time. Their evolution is characterised on the whole by the **persistence of a stock of geometric forms: signs**, which vary in their morphology from one period to another and from one region to another, and by the **increasing naturalism of figurative motifs**.

So there is a continuity through these four styles, a long progression for millennia which leads, at the end of the Ice Age, to a crash as abrupt as it is unique, since evolution features no idle periods, no retrograde steps.

In their domain, it would seem, art historians have a completely different vision of style alternation. Focillon wrote: "Each style passes through several stages... the experimental stage, the classic, the age of refinement, the baroque stage... in every sphere, every period of history, these ages or stages display the same formal characteristics; the history of forms does not constitute a single, ascending line. One style ends, another is born. Man is compelled to recommence the same search, and it's the same man — that is, the constancy and identity of the human mind — that does so" (Focillon 1981: 17). So one arrives at this fundamental question: from western prehistory to history, has the logic of formal evolution changed? Here again, any attempt at a response can benefit from Australian input. On that



Fig. 4a: Pech-Merle Cave (Cabrerets, Lot): finger marks of the hieroglyph ceiling with a sketch of the underlying block on which the artist stood. Note the presence of an ibex in the middle part (tracing by M. Lorblanchet).

continent, the evolution of art is very far from being established, which is an advantage since it means there is no tradition of thought. The debate remains wide open there, and in fact the questions being asked concern the evolution of the whole of prehistoric art.

Since the recent discovery by R.G. Bednarik and his team of some 25 caves containing digital markings in the whole southern part of Australia, it has become possible to believe that in Europe and Australia parietal art began with non-figurative digital traces. This hypothesis, put forward by Breuil for the decorated caves of the Reindeer Age, and today taken up by Bednarik for both these regions of the world, requires support from complementary studies (Bednarik 1985, 1986).

But these markings are not dated with any precision in either France or Spain. Very few have been correctly recorded. It has never been established that they are as old as the Aurignacian engraved blocks. At Gargas, one of the oldest Palaeolithic sanctuaries, they are Perigordian, as they are no doubt at Les Trois Frères. So they do not exactly represent the beginnings of art. Some can simply be ranked

among the first parietal decoration in caves. Others, like those of Rouffignac, form part of a homogeneous Magdalenian ensemble. At Pech Merle, in the course of recording the author has noted that the ceiling of the Hieroglyphs was produced in two successive episodes: human figures and mammoths drawn with two fingers joined together were superimposed on a first assemblage of disorganised markings. The second phase seems to belong to the period of the Black Frieze, which is certainly not the oldest artistic episode in the cave (Fig. 4).

With the exception of those of Koonalda, the Australian 'macaronis' are not dated with any greater precision than the European ones.

Nevertheless, their existence and their identity at a distance of 20,000 km constitute an important piece of evidence, although one can envisage the presence of disorganised finger tracings in very different places and periods: for example in the cave of La Vache in Ariège, where they seem to be protohistoric, or in the cave of Mecca, Tennessee, where they date from the 12th to the 14th centuries (Faulkner 1982).

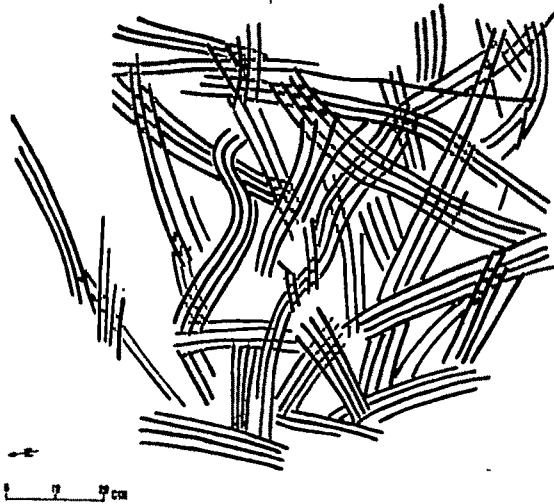


Fig. 4b: Koongine Cave's ceiling (Southern Australia): finger flutings (tracing by Bednarik 1986).

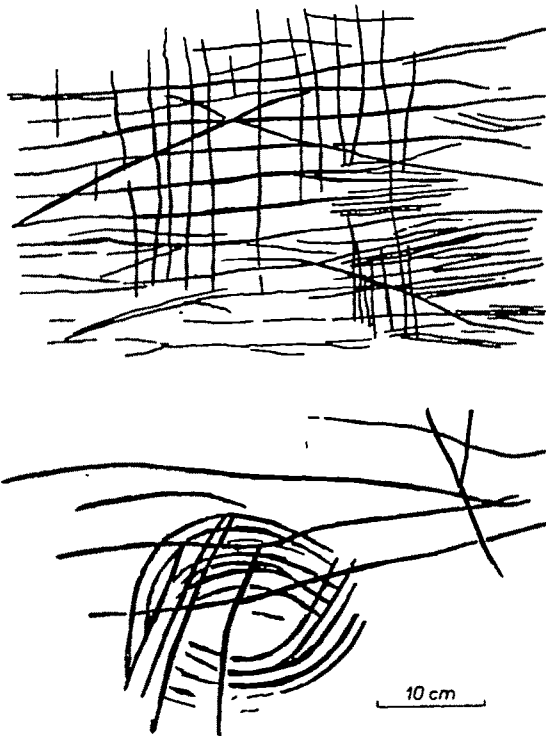


Fig. 4c: Koonalda Cave (Southern Australia): grid and oval design sketched on the soft wall by a flint flake or a stick (after Edwards's photograph 1966).

The Australian and Palaeolithic markings differ, in fact, not only in their particular context but also through their close association with true motifs, exclusively geometric ones in Australia, but both geometrics and animals in Europe.

The pan-Australian Panaramitee style is dominated by pounded engravings of (mostly animal) tracks and circles, and is also from an early phase; its beginnings are undoubtedly Pleistocene.

Observations by Bednarik and Rosenfeld would seem to show that, in a period before 15,500 B.P., circles and converging lines, notably the trident motif, appeared in the midst of these unorganised digital or hammered markings. These new motifs subsequently came into their own in Australian art, originally constituting the "Karake style". The trident motif, at first purely abstract, seems to have taken on new meaning in the Panaramitee style, where it became a bird-track.

Australian scholars would place at the other end of the evolutionary sequence certain naturalistic figures which developed along the continent's tropical coasts, notably the great polychrome figures and X-ray style of Arnhem Land (the latter still used in bark paintings), and the Wandjina art of the Kimberleys, which is renewed seasonally even today. Moreover, these assemblages sometimes incorporated figurative elements brought in by the whites after colonisation.

But what happened between the art of Koonalda and Panaramitee on the one hand, and X-ray art on the other, still remains a matter for speculation. Australian archaeologists have displayed several contrasting attitudes, which can be characterised by the opposing terms "linearism" and "regionalism".

F.D. McCarthy (1967) proposed an evolution based on superimpositions and on progress in techniques; this system seems to have been heavily inspired by the works of Breuil. After 1970, Lesley Maynard tried to pull together all the accumulated data, and present a first synthesis of Australian art's evolution. In accordance with modern ideas about Palaeolithic art, impregnated with Leroi-Gourhan's theories, she opted for a single progressive linear evolution in three great successive stages: the "Panaramitee style", the "simple figurative" and the "complex figurative". So a steady progression led from the simple geometric forms to naturalism and to a zenith represented by the polychromes (Maynard 1976).

Other scholars such as R. Edwards and P.J. Ucko, on the other hand, emphasised the diversity and abundant richness of Australian art which compromise any generalisations about stylistic chronology (Edwards and Ucko 1973).

After studying the paintings of Arnhem Land for over twenty years, George Chaloupka showed that, in the region he knows, the most naturalistic and animated style, which he christened "dynamic figure style", was one of the oldest. This style — often called "Mimi art", using an Aboriginal term in an excessively broad and inadequate sense — seems to be Pleistocene and contemporaneous with the Panaramitee style. It dates back to about 20,000 B.P., whereas the entirely

static X-ray figures correspond to a rise in sea-level that he calls the "Estuary phase". So they are much more recent than the dynamic art, and evolution produced ever rougher styles (Chaloupka 1984).

This regional study therefore contradicts Maynard's unilinear theory, which consisted of a progression from the simple to the complex.

Similarly, the author's study of the Dampier engravings (Western Australia) revealed a Pleistocene phase, a hunters' art, linked to an exclusively terrestrial environment and dominated by big human and animal figures; a marine art is superimposed on this, and is accompanied by shell mounds and a shoreline that was close to its present position. The first Dampier engravings, associated with a radiocarbon date of 18,500 B.P., are no doubt contemporaneous with certain Panaramitee motifs, and perhaps with part of the Arnhem Land dynamic art. Although drawn very roughly and conventionally, they are often realistic figures and not exclusively signs (Lorblanchet 1980, 1983). So the variety in regional styles is quite obvious.

Hence, a rapid comparison of the evolution of forms in the arts of Europe's Palaeolithic and historic periods on the one hand, and in Australia on the other, poses a methodological problem as well as a more basic problem.

The methodological problem is that in these different domains scholars are applying the different models that come to mind when dealing with evolution: the linear scheme (Leroi-Gourhan and Maynard), the cyclical scheme (Breuil) or the "bushy" scheme with temporary progressions and regressions.

Both in Europe and in Australia, the evolution of prehistoric style is thought to follow, on the whole, the same laws as those of tool industries or human lineages. The relative chronology of images, tools or palaeontological families sometimes oscillates between linear, cyclic and bushy schemas.

Despite the trial runs and regressions that characterise it, bushy evolution has a path, it follows a general direction. The regional facies, no matter how varied they may be, fit into a general progression. A comparative study of the stylistic chronologies established in recent years for Cape York, the Queensland plateau, Arnhem Land or Dampier scarcely seems to bring out any kind of communal direction. So it is not impossible that future research and improved knowledge will lead to a complete fragmentation, the multiplication and dispersal of unrelated stylistic units, although it may be hard to deny the existence of influences.

The idea of an absence of evolution may yet become established. Some anthropologists promote socio-cultural factors to explain alterations in style. Hence Layton wonders if the change from the dynamic Bradshaw figures to the static Wandjina art (Kimberleys) might not be explained by

a profound cultural change marked by the adoption of clan totemism (Layton 1985: 450).

Europe's post-Palaeolithic art is also rich in astonishing stylistic breaks: hence, the static naturalism of the old Spanish Levantine art gives way to the narrative dynamic style of its later phase while, at the end of the Bronze Age, the engravings of Valcamonica cease being static and symbolic and become fundamentally dynamic and anecdotal. According to Abélanet, this evolution in the Camunian style was due to a social change, the "abandoning of old community customs and the associated religion, and the arrival of a more individualist, highly structured society dominated by warrior-aristocrats" (Abélanet 1986: 263).

Molyneux (1989) has shown how the colonisation of North America profoundly affected the style of Algonquin rock art, causing a change from a static, symbolic art to a narrative art; from a world centred on the animal to one centred on people, accompanied by an increasing personalising of human figures.

These explanations may appear convincing, but are they applicable more generally? Do socio-cultural changes always bring about stylistic breaks?

Far from being as homogeneous as has been claimed, Palaeolithic art too displays some discontinuities that remain unexplained: for example, the faces of Venus XV from Dolni Vestonice, the Brassempouy head and the La Marche engravings are true **portraits** which break with the Upper Palaeolithic's general schematism of the human figure, often reduced to simple anthropomorphic silhouettes, anatomical segments or bestialised figures.

It should not be forgotten that, according to radiocarbon dating, one of the oldest works of art in Europe, perhaps earlier than any animal figure, any vulvar image, is a 3-dimensional and eminently human face: that of Venus XV from Dolni Vestonice dated to 26,000 B.C. (Delporte 1979)! Similarly, the La Marche portraits are probably linked to a different conceptual environment from that of most Palaeolithic art. It's a different art, perhaps secular and related to everyday life, as indicated by its presence in a rock-shelter dwelling.

So one has to admit that social, cultural or religious factors generally play a role in the evolution of styles, and that the Reindeer Age's artistic chronology, like that of its tool-industries, cannot be based only on a continuous development of the human mind implying a form of "progress". The phenomenon of naturalism "increasing" through the millennia, as conceived by Leroi-Gourhan, is a surprising notion, but it may be equally dangerous to deny any psychic component in the evolution ups and downs. Once again we find ourselves up against the complexity revealed in the birth of art and the difficulties in apportioning the "biological" and the "social" in the evolution of all human activities.

Furthermore, Australia provides many interesting examples not only of isolated figures being reutilised, as pointed out above, but also of the incorporation of ancient stylistic traditions in new artistic cults and fashions; the dynamic figures (Mimi and Bradshaw) have a place in present-day mythology, although it is undoubtedly very different from the role they played in their remote beginnings, and they have resurfaced in the bark-painting art of Arnhem Land. It is not impossible that the reindeer hunters, like the painters of Australia's tropical coasts, or those of the western Renaissance who reinterpreted Roman art, also underwent similar reversions, which don't make the prehistorian's task any easier.

Everywhere, research and discoveries are modeling, adjusting or rectifying previously proposed chronological systems. The emergence of regional styles is diversifying, complicating and sometimes calling into question the evolutionary schema of Upper Palaeolithic art. For example, progress in our knowledge about the Rhone Valley and Quercy groups seems to emphasise a two-stage evolution, rather than the four-stage one proposed by Leroi-Gourhan (Combier 1984, Lorblanchet 1989).

Study of the apparent disappearance of naturalism at the end of the Ice Age will no doubt move into questions of geography, since the Magdalenian's very lively naturalism is locally prolonged in the Azilian of south-west France (at Pont d'Ambon, the abri Murat and La Borie del Rey) where, little by little, it makes way for triumphant geometrism, whereas it is maintained and seems to get its second wind in the western Mediterranean basin, Italy and the Spanish Levant where it gives rise to a new style (Lorblanchet 1985).

Finally, the apparent contrast between the stylistic evolution of Europe's prehistoric and historic periods also poses a fundamental problem that is far from solved: can this kind of difference be explained through the simple assumptions of scholars, a lack of knowledge about prehistory, or is there really a fundamental change in the rhythm of artistic creation from prehistory to history, with a change from a somewhat bushy evolution to a rather cyclical evolution, as described by Focillon?

Abélanet's (1986) "Signes sans Paroles", enables one to discover all the diversity, the shimmering of artistic cultures and traditions that followed the Palaeolithic. The succession of styles with a duration of just a few centuries or one or two millennia appears amazingly rapid. This acceleration in the rhythm of evolution seems to have begun at the end of the Ice Age, but in fact nothing explains it or justifies it. It remains a profound mystery, and hence casts further doubt on the validity of the chronological systems defined by Leroi-Gourhan.

Comparing the reindeer hunters' art with that of the kangaroo hunters does not merely shed new light on their respective contexts, meanings and chronologies. We can also

learn a great deal through a comparison of their techniques and forms.

Techniques

Australian paintings are generally associated with a light rock, most often sandstone, whereas engravings are usually found on dark rocks such as intrusive, metamorphic or volcanic rocks with a weathered surface. In both cases, it is a contrast in colour that the artist was seeking. This contrast was obtained either by allying material (pigment) or by destroying the degraded superficial crust and revealing the rock's inner surface which is lighter.

These very general observations have to be tempered by noting the presence of a few engravings in painted sandstone shelters, in Queensland for example, and of paintings on granite walls, such as in the Australian Alps, in the Canberra region.

Like many open-air engravings throughout the world, and especially Europe's Mesolithic and protohistoric specimens, almost all Australian engravings were carried out by pecking or by some process derived from it. The resistance of the rock also determined the choice of hammering techniques. At Dampier (Western Australia), the large-grained and relatively soft gabbro blocks carry deeply pecked lines or areas ("intaglios" for Australian scholars) whereas on very hard, fine-textured granophyre blocks with conchoidal fractures, they preferred superficial pecking and its variations: roughening, hammering or grinding.

Given the importance of the natural data, it was clearly unwise to base the chronology of Australian art primarily on variations in technique, as McCarthy did when he attributed a cultural meaning to these variations, especially as a different natural phenomenon, selective preservation, has favoured certain techniques: hence, deep pecking doesn't necessarily characterise an archaic stage on its own since it survives more successfully.

Whereas it is extremely rare in Australia, the linear incision with a V-section was favoured by the artists of the Reindeer Age. However, the Aurignacian engravings of vulvas used a linear pecking of Australian type, that is, relatively wide and deep grooves made up of cupules more or less joined together (Delluc 1978: 216). Similarly, the crude drawing of the front of an ibex in the Grotte des Fieux (Miers, Lot), done with lines of cupules, had been ascribed to the Aurignacian by Glory, who based this attribution primarily on the "archaic" technique. The Fieux ibex in its turn poses the interesting problem of a technique's chronological value, or rather of the necessary separation of natural factors and truly cultural factors that guided the choice of techniques. During recording of the Fieux block, the author noticed that the support of soft, weathered stalagmite could explain to some extent (but how far?) the use of deep pecking. It might be a simple adaption of the technique to

the support, as is even more obvious on the panels of finger tracings which are necessarily restricted to soft clay surfaces. These problems, which are more complex than they appear, are as prevalent in Australia as in the European caves. If digital markings and pecking depend exclusively on the demands of the rock-support, one would have to admit that they were used at very different times. But we don't know if

that was the case. Some techniques probably had a cultural and chronological significance. We have already seen how present-day Australian art reveals the importance of the social conditioning of the painting techniques. So some groups, at certain times and places, must undoubtedly have preferred particular techniques, and therefore sought out suitable walls; but these techniques, part of a permanently

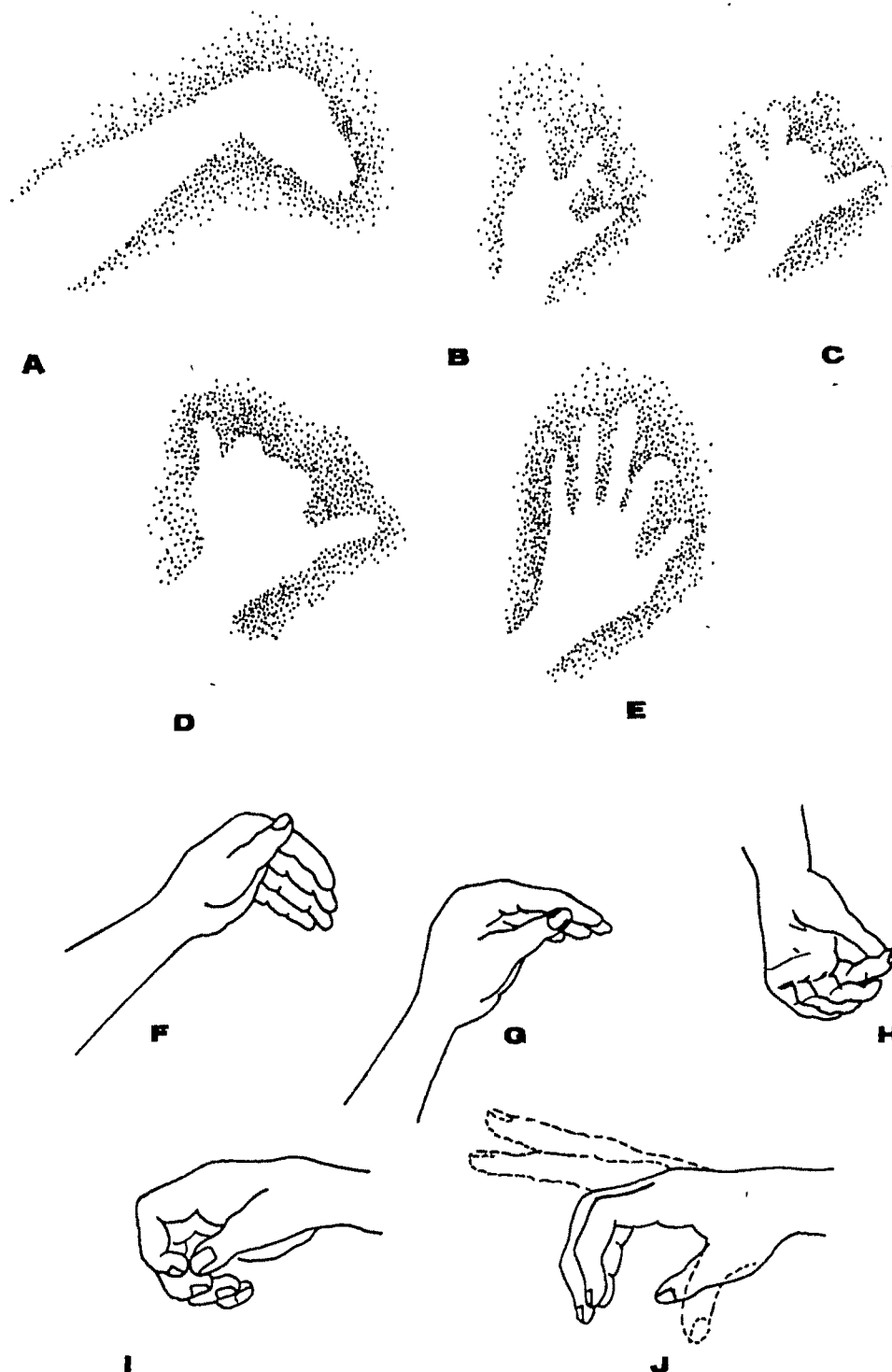
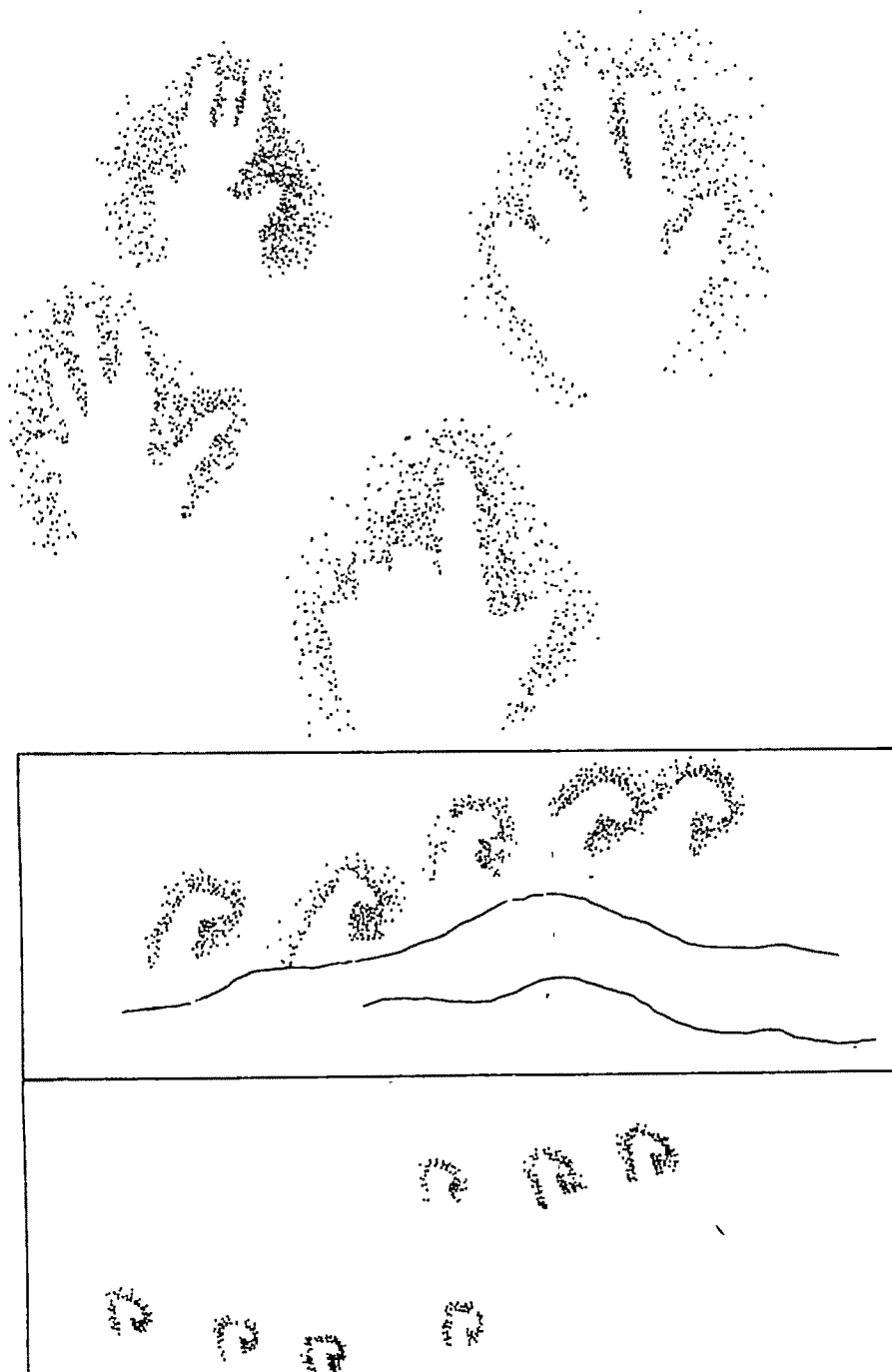


Fig. 5a: Stencils of Queensland with sign language. A, B, C, D and E = examples of hand stencils with bent fingers in the Black's Palace shelter (after Morwood 1980). F, G, H, I and J = examples of sign language from the same region. F and G = emu, H= pelican, I= opposum, J= cockatoo (parrot) (after Roth 1897: n. b. A looks like F and G).

Fig. 5b: Above: stencils (outlined in black) of four incomplete hands from Gargas (Hautes-Pyrénées). Below: stencils (outlined in black) of five folded fingers from Gargas and stencils (outlined in red) of seven folded fingers from the dotted horses of Pech-Merle.



available arsenal of processes, could also have sprung up again sometime to respond to the specific demands of the rock, and in that case the dialogue between man and wall was reversed.

Although some digital tracings are Magdalenian, many others are probably among the oldest cave decorations. Palaeolithic peckings may all be very ancient, since we know of no Magdalenian pecked work. The Fieux ibex seems to evoke the pecked caprid on a block from Belcayre which was found sandwiched between two levels of typical Aurignacian.

Other techniques, such as red unilinear drawings, for example, or the stencil, which were basic pictorial techniques of very general use, also underwent extraordinary development in certain periods and places which makes them valuable ethnic chronological markers.

Simple stark red lines, often used for deer and bovid outlines, flourished particularly in the Rhone Valley and Quercy during the first regional phase before the Magdalenian and date to around 20,000 — 22,000 B.P. according to the result obtained in the Grot du Bidon (Combier 1972, 1984; Lorblanchet 1972, 1984).

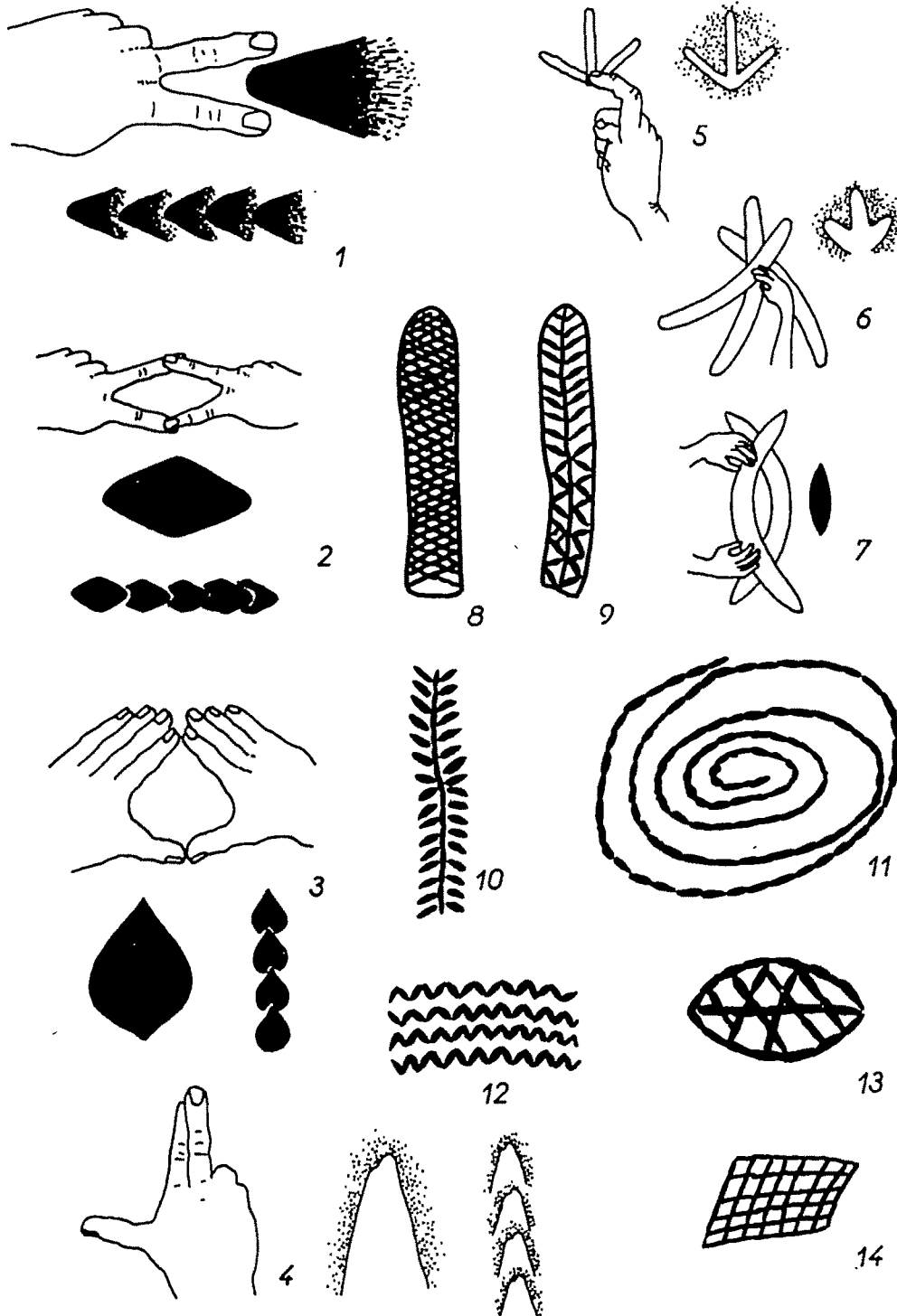


Fig. 6a: Stencil technique on the Queensland plateau (North-Eastern Australia) (after Walsh 1983): 1 to 7= utilisation of various screens. 8 to 14= examples of results obtained (most often red).

Here again, the Australian situation is comparable: whereas hand stencils abound throughout the whole of Australia including Tasmania, they are especially numerous on the Queensland plateau where they give rise to a spectacular stencil art, a regional art of great complexity, as has been shown by Morwood (1980) and Walsh (1983).

Beside stencils of objects, weapons, animals and even a whole human body, there are innumerable hands, often

incomplete, and in very varied positions and displaying all possible finger-combinations. In fact, many are images of fingers or hands in profile, showing that, in this case, most of the incomplete stencils are clearly cut to bent fingers and not amputated phalanges. These observations cast considerable light on the interpretation of the hand-images of Gargas, especially as Morwood established a parallel in his thesis between the hand-signs (representing animals) of the central

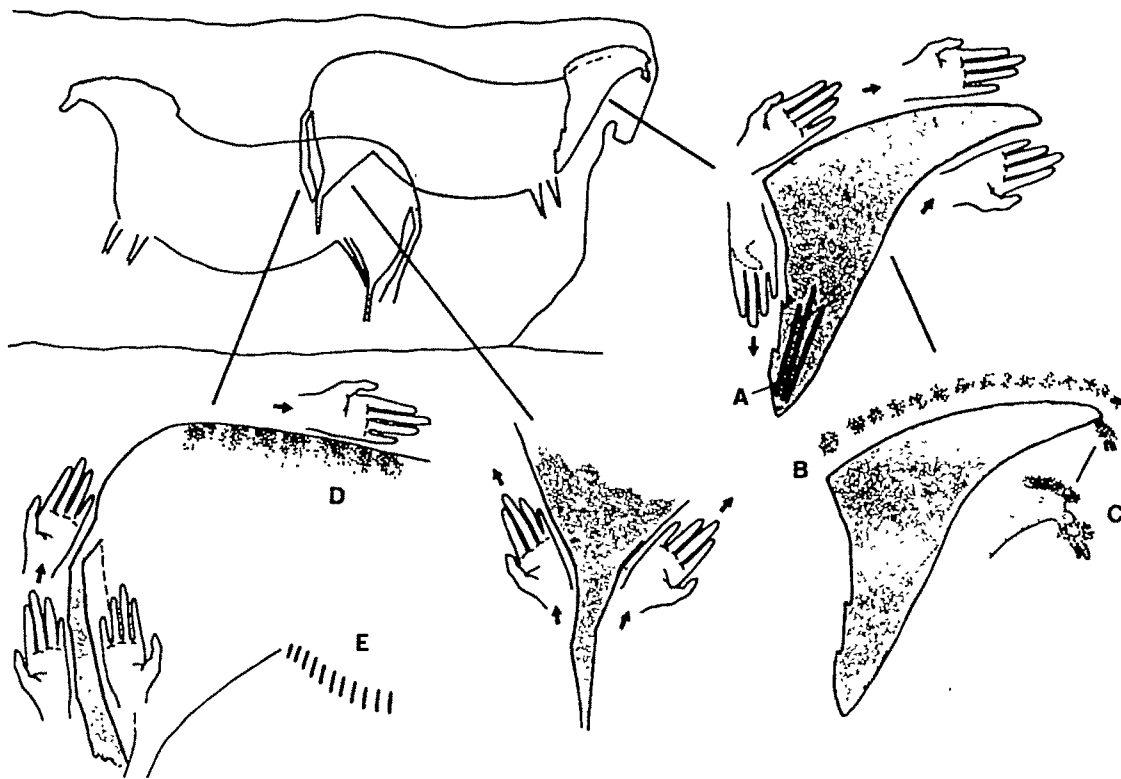


Fig. 6b: The spotted horses of Pech-Merle were made with the stencil technique, using hands as a screen: A= striations in the lower part of the neck showing that the pigment has been spread out by finger rubbing. Note the little finger's mark on the outline of the neck (the thumb is then folded under the hand). B= the mane was drawn by a series of small dots. C= the head is made of dots obtained by blowing and two digital marks simulate the horse's mouth. D= the back consists of a series of fused dots abruptly stopping where the fingers end. E= the horse's belly is made of small parallel stripes drawn with the fingers; they represent the hair.

Queensland plateau and the apparently "mutilated" hand stencils of this region. Leroi-Gourhan's hypothesis that the Gargas hands were derived from a sign-language of Palaeolithic hunters looks all the more convincing now. Furthermore, by using Aboriginal techniques of spraying ochre, the author has reproduced these images in experiments (Lorblanchet 1980).

Walsh has revealed the complex stencilling methods, using screens formed by leaves, boomerangs, or the fingers or palm of the hand in a wide variety of positions, that were employed by the region's Aborigines with powdered ochre of different shades of red to produce incredible panels of linear and geometric drawings, grids, ladders, zig-zags, tree-shapes, circles, spirals, etc., which scholars had studied for 40 years without realising they were stencils. This sophisticated spraying technique seems to have been developed because of the particular fragility of the sandstone walls of the local shelters, which allowed no direct application of pigment, and it rapidly gave rise to technical refinements and exploits that became part and parcel of the local culture (Figs. 5, 6, 7).

A somewhat similar phenomenon may have occurred when paintings were made on the often bumpy walls of

concretions in the Quercy caves. The author reexamined these paintings with the Queensland stencils in mind, and discovered that many of the animal figures, including their linear contours, had in fact been produced **entirely by spraying**. This is the case, for example, for the big bison in

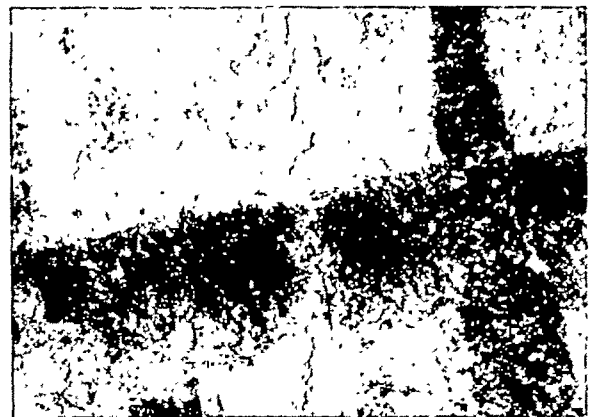


Fig. 6c: Infra-red photograph: detail of left horse's back superimposed on right horse's tail (on the right). The sketch is in fact formed by a series of fused blown dots; the upper side is straight (stopped by hand screen, whereas the lower side is hazy).

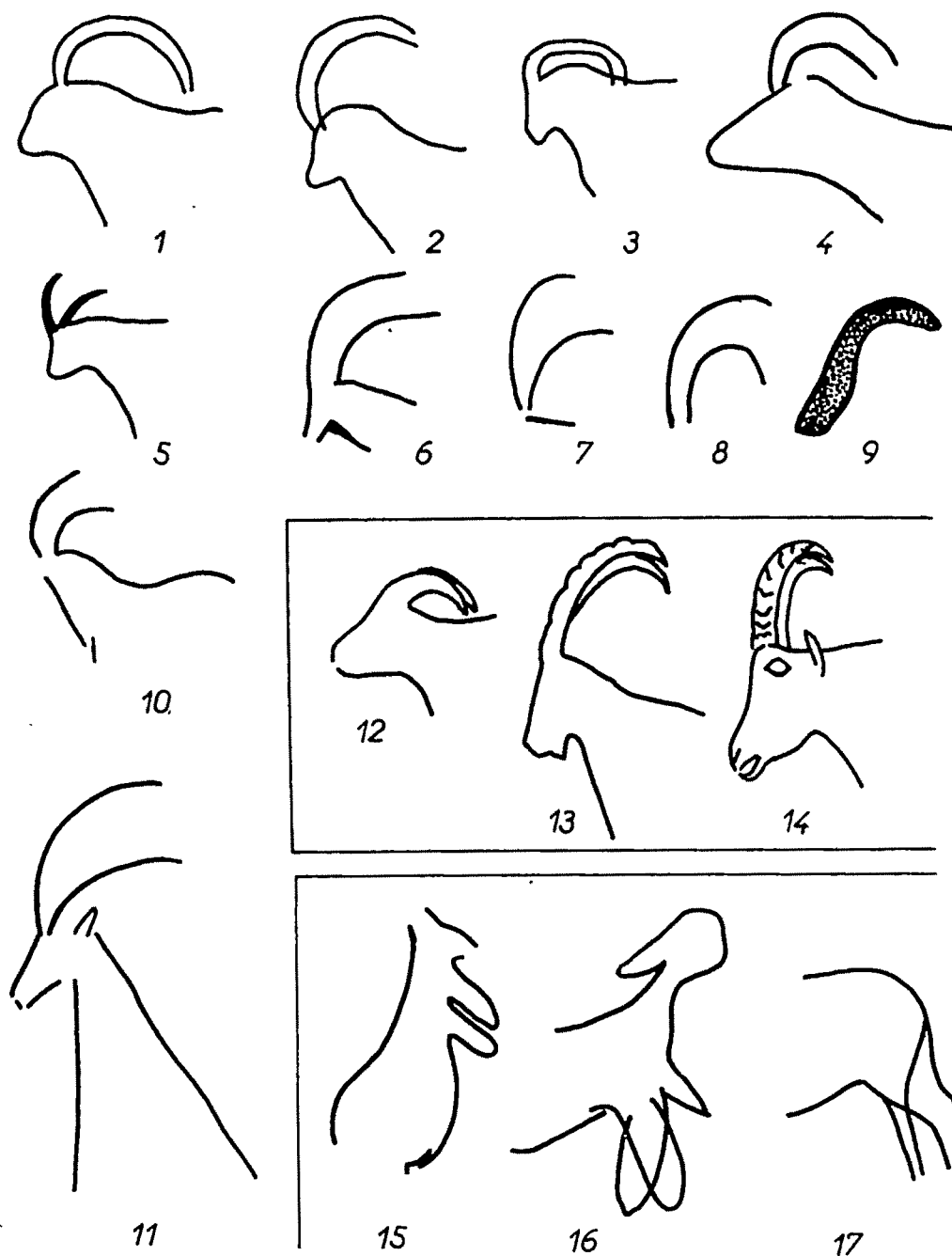


Fig. 7: Projection on a plane and perspective in Quercy Palaeolithic rock art: 1 to 11 = first group of Quercy painted caves (1 to 9= Cougnac, 10= Pech-Merle, 11= Roucadour). The horns are on the same plane and parallel, (1 to 4) or half distorted and divergent (5 to 8, 10, 11) or in normal perspective (9). 12 to 14 = second (Magdalenian) group of painted caves (12= Sainte-Eulalie, 13= Carriot, 14= Pergouset). Separation of planes, perspective and modeling of the horns. 15 and 16 = female figures from Pech-Merle's ceiling, sometimes with breasts projected on a plane and parallel, sometimes in "transparent perspective" (16). Another example of "transparent perspective" is a hind leg of a Megaloceros from Cougnac (17).

the Grotte Marcenac (Lot), and the famous spotted horses of Pech Merle.

Where the latter are concerned, an extremely skillful technique was revealed by infra-red photography which brings out the successive sprayed patches that were used to paint the flat wash as well as the lines. The artist used the left hand as a screen.

The horses' necks were obtained by a complete spraying, and then the pigment was spread out by rubbing the painted surface with the fingers, as can be seen in some darker, parallel marks inside the coloured area. The lower

edge of the neck is a distinct line produced by moving the hand to prevent the manganese powder from spreading downwards. Towards the shoulder, the neck also ends in a clean line comprising small indentation formed by the negative imprint of the screening-hand's little finger, when it was gradually moved as the work progressed. The mane is formed by a series of diffuse little dots joined together, which are an excellent representation of a mass of hair. The line of the back is formed by a line of joined-up dots, the upper edge of which was cut off cleanly every time by the hand-screen, whereas the lower edge was left to spread so that its hazy appearance gives the illusion of the animal's

rounded flank. The tail has a diffuse, open end, whereas its broken outline was obviously produced by a screen; it too was entirely sprayed in the gap formed by two hands laid parallel to each other. The 'V' or the upper hind legs was obtained by the same method, though here the hand-screens were in a convergent position. Exactly the same is true of the white space separating the two hind legs of the left-hand horse; here again, both hands were used as a screen. Only the fine lines of the front legs were obtained by finger-rubbing, while the stomach-line of the right-hand horse comprises a series of little vertical stripes, parallel and regularly spaced, which suggest the hair of the abdomen.

Finally, the seven red stencils of bent thumbs in profile, on the back of the left-hand horse, identical to others at Gargas and Les Trois Freres, also evoke the memory of Queensland's art by recalling the series of bent fingers in that remote region's shelters.

Hence, one can say that the Pech Merle horses are not only accompanied by 252 dots but also, apart from a few details, are **themselves composed of dots**. Like the hands that surround them, they were produced by the technique of spraying pigment and by stencilling. This technique establishes a continuum from hand stencils to blended dots and the contours of some animals. Very much in force during the Quercy's first pictorial phase, and also at Lascaux, it seems to have had exceptional symbolic value because it was human breath, the profoundest expression of life, that directly created the animal or signs on the wall. There cannot be a more authentic **projection**, in every sense of the word, nor a closer communion between the creator and his work.

A comparative study of forms and, notably, of the representations of space and time, in the arts of Australia and the Palaeolithic can contribute some useful insights into some further differences and similarities between these two worlds so far apart.

Forms and Space

The contrast in engraving techniques outlined above already expresses in itself some very different approaches to volume among European and Australian artists. Fine Palaeolithic engraving, so vibrant and sensitive, is conducive to precise description, virtuosity of line, perfection and truth of form — that is, naturalism. In contrast, the broad, pecked engravings of the Aborigines tend to turn the whole surface of the motifs into silhouettes. They are the first expression of a fondness for decoration and an attraction for the plane, rather than for precise lines. Australian rock art is a surface art *par-excellence*, with no depth or perspective. The total absence of bas-relief on decorated walls in Australia is quite significant.

During the ceremonies, some coastal tribes of north-east Arnhem Land make sand sculptures on the ground. Even if these sometimes incorporate stone blocks, leaves or

branches, the artists are not really concerned with representing the third dimension. These are, in fact, simple beach drawings, sometimes extending for dozens of metres, rather than true sculptures, since they reproduce the outline, not the volume, of the subjects represented (Ross and Hiatt 1977).

Moreover, prehistoric carving-in-the-round is unknown in Australia because the Aborigines did not carve stone, apart from a few *Tchuringas* which bear deep engravings that are close to sculptures. Today, on the other hand, along the tropical coasts of the Northern Territory, part of Cape York and the Kimberleys, there are rough-outs of statues carved in tree-trunks, a soft material worked with European tools, especially steel axes. Both on *Ranggas*, wooden posts representing mythological divinities that were used in religious rites, and on funerary posts, the sense of decoration is always far more important than the sense of volume. These are simply humanised poles transformed into decorative objects and decorated with complex geometric symbols. The symbols' forms are closely adapted to those of the support. It seems that this is a newly introduced artform, as shown by the *Wuramu* posts of the coast of north-east Arnhem Land which are strongly impregnated with the Indonesian influence that affected this littoral area for several centuries. In the domain of rock painting and engraving, the plane-view is expressed in three fundamental ways: a reduction to tracks, projection on a plane, and transparency.

Prints and tracks are a fundamental element of Australian iconography. They constitute a basic theme that persisted throughout rock art's entire duration in the whole of the continent. They highlight two fundamental trends in this art: a constant reduction of space to the plane, and a marked taste for geometric schematisation of motifs which, in the centre of the continent, sometimes borders on writing. In fact, the abundance of drawings of prints is not merely a reflection of the desert or semi-desert environment where reading the game's traces is a daily activity for nomadic hunters; it seems to be linked above all to the artists' mental structure. Many subjects, such as lizards, crocodiles, turtles and echidnas (porcupines) are depicted as if seen from above, and are often represented as silhouettes with no inner modelling. Motifs drawn in elevation, like human figures or certain animals, are anatomical plates, displaying the organs in order to enumerate them, or make a kind of inventory of them and show them in their entirety: both eyes, both ears, both breasts, both testicles, the four limbs, the flippers, are placed side by side. Absolute profile, that is, animals showing only one leg from each pair, is not completely unknown but is extremely rare. The intellectual realism expressed in this process of **projection onto a plane** which is quite general in Australian art although less common in the ancient dynamic styles, even leads to the flat depiction of feet, hooves and hands as if seen by their soles or palms, i.e. as if they were prints. Hence, isolated drawings of prints are

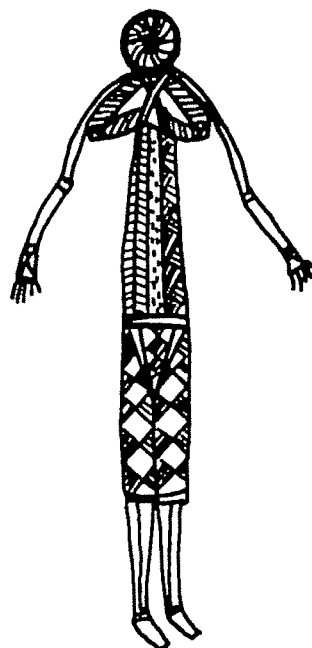
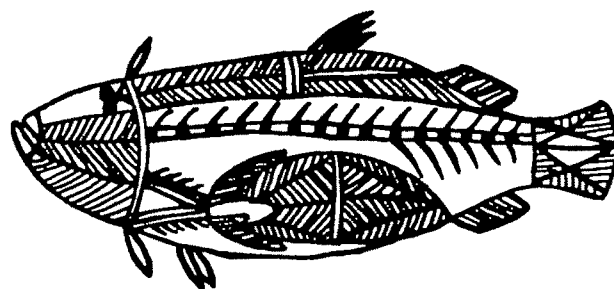


Fig. 8: Projection on a plane and transparent perspective in Australian art (Arnhem Land, Northern Australia). Left above: late X-ray style: woman with breasts turned sideways. Right above: late Mimi style: a man, two women and a child: arms, breasts, and penis turned sideways, high valley of the Alligator River. Below: red painted fish. X-ray style (after Brandl 1973).



simply fragmentary drawings, characteristic parts that represent the whole individual and produced with the same point of view as all the other figures. Prints provide a marvelous definition of Aboriginal perception of space (Fig. 8).

Australian rock art includes drawings of prints, or real prints, of animals, humans, objects and plants. The most common animal prints are drawings of *Macropod* (kangaroo and wallaby) and bird (especially emu) tracks. In the pan-Australian Panaramitee style, which began in the Pleistocene, tracks alone account for 50 to 70% of all the figures. They then spill over this style's geographical and chronological boundaries to become one of the most constant themes in all regions and at every stage in evolution (Edwards 1966). Drawings of turtle tracks are common among the coastal engravings of the Pilbara (north-west). They comprise three parallel pecked lines, 10 to 15 cm long on average, and sometimes joined at the ends. In this way they take the form of a longitudinally stripped oval. They depict the traces left by marine turtles (especially the green turtle) when they climb onto the beaches to lay their eggs in the sand where their heavy bodies and flippers leave deep grooves.

Human prints, a little less abundant than those of animals, are figures of hands, feet (plus one stencil of a

complete human silhouette in southern Queensland), and digital tracings which merely require a mention here as a reminder. Hand stencils, more numerous than positive hand prints, are often extended by the depiction of arms. In Arnhem Land, the inside of some hand stencils was decorated with geometric motifs (Lorblanchet 1985). Stencils of objects are precious because they record the true shape of the tools depicted, and permit measurements. There are stencils of boomerangs, baskets, clubs, spears, and hafted stone or metal axes. All these objects provide valuable information on the tool industries, often completing ethnographic data by revealing unknown types (Rosenfeld *et al.* 1981). They also often underline the masculine nature of rock art because they depict primarily the tools used by men (Morwood 1980). The more original plant-prints are impressions of grasses recorded by Chaloupka in Arnhem Land decorated shelters, where a few walls seem to have been lashed with big grasses soaked in liquid ochre (Chaloupka 1984).

Despite their standardisation and the frequent schematism that links them to signs, prints provide enormous amounts of information about the objects depicted. In the Kimberley shelters, Elkin noted that the men of the tribe can recognise the creator of each hand stencil or print, and after that person's death the image of his hand on the rock evokes his memory. They then speak of him "with tearfilled eyes" (Elkin 1930). Here is another example of the precision of prints: the only specific identifications of Macropod depictions carried out until now in Australia have been obtained from engraved tracks, not from complete animal figures (at Sturt's Meadows, New South Wales — a site studied by Clegg and McDonald).

According to the creation stories, the present-day world carries the unchanging prints of the supernatural beings. Fixed in space as well as in time, the print makes a presence permanent. The direct physical mark of an individual on his environment, it symbolises that beings are deeply rooted in the world around them; it is the link with the original earth where the creator spirits slept and still rest.

Intellectual realism is also displayed in the phenomenon of **transparency** developed in the X-ray style of Arnhem Land. The internal organs, muscles, skeleton and digestive system are also depicted as if the subjects had been examined with X-rays. It is the denial of thickness. The drawing-as-inventory bypasses appearances. The artist retains only the general form of the subject's exterior. This X-ray art is still used today in bark painting (Fig. 8).

Aborigines have provided somewhat contradictory information about the meaning of transparency. Some of them say the depiction of internal organs was intended to show the edible parts of the animal. Others claim the organs depicted were the vital ones, drawings of which were used in ceremonies aimed at facilitating the resurrection of animals killed during the hunt (Brandl 1973: 168). In fact, it seems to be simply a style of drawing, with no special intention, which spread in a given region in a period that is probably fairly recent although its origins are impossible to pinpoint exactly. One should add that the organs depicted are not presented in minute detail; they are simply indicated symbolically, and not all are present. They are often decorated with geometric drawings, are schematic and form part of the decor.

The world of European Quaternary art is a very different world of forms. Even if, like their Antipodean contemporaries, the Reindeer Age's artists often used a kind of projection on a plane, they differ through their taste for volume and a more marked attachment to the visual aspect of some of the subjects they depicted.

The La Grèze bison is a perfect example of these flat European images that lack any perceptible volume. But this absolute profile, this empty silhouette displaying only one leg per pair, and the horns shown full-frontally in what Breuil called

"twisted perspective" — an amusing term for describing the absence of perspective! — displays a higher degree of schematism than most Australian works. Leroi-Gourhan's term of "synthetic figurative" expresses this engraving's striving for simplification and stylisation; it is an effort quite different from the intentions expressed in Australia's descriptively and analytically full-frontal inventory-pictures.

When Palaeolithic artists reduced things to a plane, as they too sometimes liked to do, it was done with a particular mentality. It was also accompanied by a tendency to break up the graphisms, for example a quite common reduction of animal figures to the head, the head and neck, or a dorsal profile, a phenomenon that is unknown in Aboriginal art which reduces animals not to a few elements of their visual form but to the flat marks they leave on the ground, i.e. their prints.

However, even in the oldest figures on blocks or walls in Franco-Cantabrian sites, one can detect a kind of tendency towards relief. The engraved or pecked line is sometimes so deep and broad that it isolates the motif, and makes it stand out. These first attempts can be seen at Pair-non-Pair, and in some vulvar motifs on the Aurignacian blocks of the abri Cellier and La Ferrassie. According to the Delluc (1978: 428) "these preparations make the image stand out from its rocky support in a crude form of *champlevé*, of false relief, but which never surrounds the figure's whole outline. These are only very rare and very partial attempts to employ a technique that was to blossom during the Upper Perigordian".

With their heavy forms, the Perigordian Venuses are, for the most part, a collection of spheres, a kind of 3-D construction game rather than a realistic expression of feminine forms. They are an attempt at geometrising the human figure in space, in which a sense of geometry blends with the quest for volume. It was at the end of the Gravettian, in the Solutrean and Magdalenian that this quest triumphed in the bas-reliefs of Laussel, Roc de Sers and Cap Blanc. Leroi-Gourhan explained how "the sight of these bas-reliefs lit by sunlight" had undoubtedly influenced the Magdalenian painters and engravers: "in their moulded figures, the relief seems to reproduce sculptures rather than animals drawn from life" (Leroi-Gourhan 1970: 153).

The Quercy region provides a few good examples of this achievement of the third dimension that characterises the reindeer hunters' art and differentiates it from that of the kangaroo hunters (Fig. 9).

At Roucadour, one of the oldest assemblages in Quercy, the forms clearly make no attempt to express relief. They are absolute profiles with one leg per pair, or two limbs side by side. As on that of La Grèze, the bison horns are projected in frontal perspective, and the same applies to the bison of Marcenac which is contemporaneous with the bison and aurochs of nearby Pech Merle.

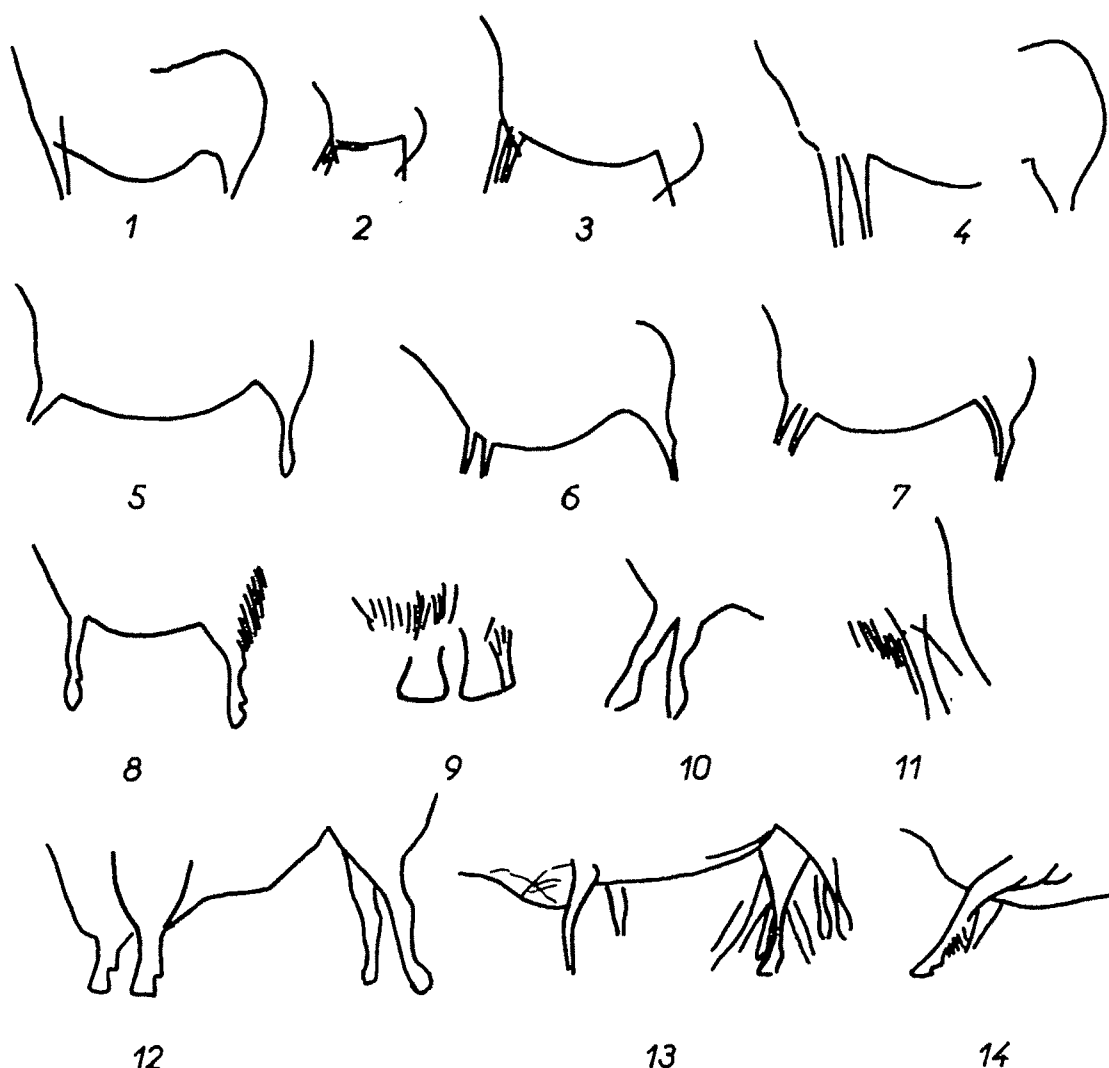


Fig. 9: Representations of animal legs in Quercy Cave art: 1 to 11 = first group of painted caves (1 to 4: Roucadour, 5 to 11: Pech-Merle); 12 to 14 = second group of painted caves (12 = Le Moulin, 13 and 14 = Sainte-Eulalie). In the first group which is older, sometimes only one leg in a pair is represented, sometimes both legs appear side by side. N.B. a first attempt at perspective on the rear limbs of a dotted horse (7). The second (Magdalenian) group, on the other hand, is characterized by its good quality.

In this great sanctuary, one can distinguish three artistic phases: the initial phase encompassing in particular the spotted horses and the Combel's decoration; the middle phase corresponding to the black drawings, the feminine and mammoth figures on the ceiling, and the bison-women; and the final phase which is that of the engravings.

In the first phase, the Combel animals (the antelopes, horse and feline) are rigid silhouettes drawn in a single plane with one limb per pair. In contrast, the masterly panel of the spotted horses reveals a concern for depicting volume and a first attempt at perspective can be seen in its separated planes. Volume is expressed, as we have already seen, through the very special stenciling technique, the skilled manipulation of screens and of blown pigment, which produce an illusion of a moulded outline. The drawing of the

legs is interesting: the front legs are set out on the flat, side by side, like in most of Pech Merle's animals, but the hind leg of the left-hand horse displays a double profile of the front of its upper part which symbolically suggests a pair of legs. The limb in the foreground is separated from the one in the background by a space, a white gap in the coloured area. This technique of the white space separating the planes was widely used in the paintings of bovines and horses in Lascaux's Hall of the Bulls and Axial Gallery.

In Pech Merle's middle phase, the animals of the Black Frieze are still drawn in a single plane and their legs are located side by side or sometimes in absolute profile; however, the hind legs of one mammoth and a bison have the beginning of a tentative cross-over, their attachments overlap very slightly. The women on the Ceiling of the

Hieroglyphs display breasts that are sometimes parallel, sometimes partly overlapping in a kind of "transparent perspective" that is quite different to the X-ray transparency of Arnhem Land since, here, the two elements are almost in their normal position and cross over each other while both remaining visible.

The wounded man of Pech Merle certainly has two legs, not one plus a "tail" as has sometimes been claimed. The second leg is simply suggested by a line drawn parallel to the first.

The same procedures can be found at Cougnac where the drawings are contemporaneous with those of Pech Merle. Whereas the animals only have one leg per pair, one of the big male *Megaloceros* displays two superimposed hind legs, slightly set apart and both visible — a further example of transparent perspective.

In all the Quercy's ancient caves, the rendition of deer antlers, and bovid and ibex horns, like that of mammoth tusks, also comprises a variable amount of projection on a plane, and a general ignorance of perspective. Two main procedures were adopted: total projection on the same plane (horns are either strictly parallel or seen full-frontal on a body in profile), and semi-distortion (the horns diverge).

Hence, in the Quercy's first group of decorated caves (those of Roucadour, Pech Merle and Cougnac) the generally flat images display a few sporadic and localised attempts at representing volume. On animal figures, it is the hind legs that are affected by these attempts, while the rest of the animal remains static and the front legs are represented side by side.

In contrast, in the second group, or Sainte-Eulalie group (Lorblanchet 1972, 1984), dating to the middle/upper Magdalenian (around 15,000 B.P. at Sainte-Eulalie according to radiocarbon), the artists have achieved separate planes in accordance with the laws of perspective.

On the engravings of a female aurochs at Pech Merle, which belong to the second group, both planes of the legs are quite distinct, and the front leg's attachment separates the limb's plane from that of the body. The animal's volume is thus drawn correctly. The engraved reindeer of Sainte-Eulalie, dating to Magdalenian III, are perfectly integrated in space. The three planes of the body and limbs are quite distinct, as on the great painted bison of the Grotte du Moulin, no doubt contemporaneous with these engravings, or on the ibex of Pergouset or the reindeer of La Bigourdane. The perspective of the ibex's horns the deer's antlers and ears, with one side partially covering and hiding the other, is also correct.

However, one should note that in all the Quercy's iconography one animal's horns remain curiously and constantly outside the laws of perspective: the bison's horns are always extremely conventional and totally unrealistic whereas the same animal's legs are sometimes placed

correctly. The Quercy's bison images are quite different from those of Ariège.

Moreover, whereas this achievement of perspective appears to have been gradual in the Quercy's parietal art, where after its infancy in the early stages (first group) it became established in the Magdalenian (second group), it is by no means certain that exactly the same evolution took place in all regions of Franco-Cantabria. There must have been differences in rhythm, and many overlaps, that still need to be determined and will be significant in themselves; they may contribute, with other features, to defining stylistic territorial units. For the moment, our intention was simply to use a few examples from Quercy to highlight this constant search for volume that characterises Palaeolithic parietal art.

The cave artists also had an admirable ability to integrate space with their creations. Like the sculptors of our Romanesque churches, the Reindeer Age's painters and engravers skillfully played with the volume of the rocky support; they knew how to give their work relief simply by using the natural forms of the wall, whose shadows came to life in the dancing light of their lamps. The trunk and hide of a Pech Merle mammoth are formed by the drapery of a concretion. A bison in the same cave occupies the entire surface of a big block, the animal's massiveness suggested by that of the block (a further example of "total-field framing" to use Leroi-Gourhan's expression). The neck of the Cougnac *Megaloceros* comprises a natural ledge of calcite. A horse in Les Merveilles (Lot) fits the curve of its back perfectly into a sinuous stalagmite floor... At Les Fieux (Miers, Lot) an isolated mass of concretion, already mentioned earlier, that was lit faintly by daylight, was used several times. The mass's natural shape emerges from the surrounding darkness to evoke an animal's body. The first time, it was completed by a pecked engraving and turned — as shown above — into an ibex. Then, at a later date, it was re-worked with fine engraving and hatching, using a common Magdalenian technique in Quercy, and transformed into a mammoth. The same rocky shape therefore gave rise to different images at different times.

This incorporation of the support into parietal works to give them depth and volume is quite peculiar to Palaeolithic art. It is perhaps linked to its environment, since caves constitute strange natural surroundings. Through their consistency, their colours, their textures and their fantastic lines, calcite forms invoke artistic forms. Limestone caves therefore constituted a particularly favourable place for plastic decoration; however, this formal vocation was not a blind determinism since, as we have seen, some natural forms lent themselves successively to different forms.

The natural surroundings in which Australian rock art developed are obviously very dissimilar. Primarily an open-air art, it is most often restricted to forms offering no problems — flat surfaces on rock slabs or the walls of sandstone rock-shelters that have been smoothed and

flattened by erosion — that cannot be compared to the European concretions (Fig. 10) The author has never observed a perfect integration of natural forms with Australian rock images. On the contrary, one is amazed by a certain indifference towards the support. For example, at Dampier, a magnificent engraving of a saw-fish covers a large surface, and the animal's rostrum suddenly breaks and continues on the other side of the rock; engravings on slabs of wounded kangaroos show spears that are extended onto the back of the blocks with a 90 degree bend. It is the presence of the spear that counts, not its visual appearance. This art is fundamentally based on intellectual realism. Certainly, the rock's outline sometimes influences the figure, since the latter often tries to occupy the available space, and elongated slabs sometimes bear kangaroos with abnormally stretched bodies (the study of a style based on analysis of proportions may be

dangerous if it doesn't take the shape of the support into account). In those cases one can, like Focillon, talk of a "limiting space", a space that "restrains the form" as op-

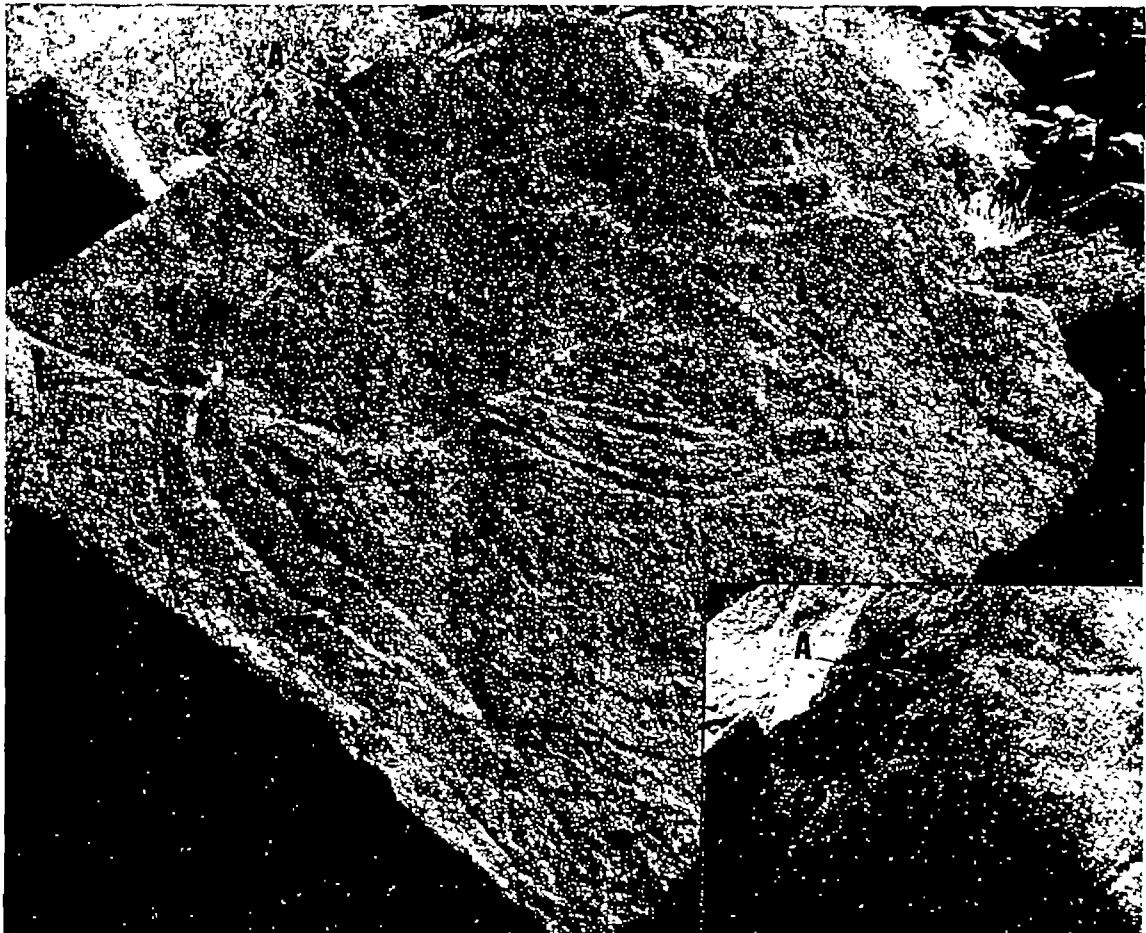
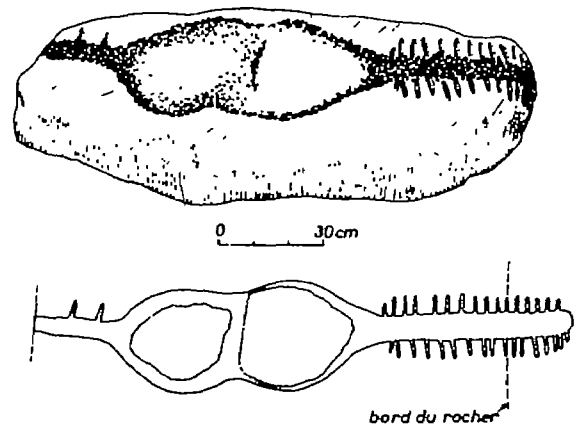


Fig. 10: Above: engraving of a Saw-fish from Gum Tree Valley (Dampier, Western Australia): length = 150 cm. (recording by Lorblanchet). This is an example of intellectual realism and of indifference as regards the support since the fish's rostrum is continued on the other face of the block. Below: Engraving of a wounded kangaroo from Gum Tree Valley (Dampier). Another example of indifference as to the support. The engraving of the javelin is bent and continues onto the other face of the block (photograph by M. Lorblanchet).

posed to the "space-milieu" where the form moves freely" (Focillon 1981: 38). Palaeolithic art's space is both a "limiting space" and a "space-milieu". The cave quivers under the pressure of internal reliefs; art animates the cave. In contrast, Australian art's space is only ever a "limiting space". The Antipodean figures are always outside the rock, they only act upon its outer skin, on which they are spread out any-old-how or fit into the frame available to them.

Hence crucial differences between Australian art and Palaeolithic art can be seen in the relationship of the figures to their support. This contrast persists if one now turns to the figures' interrelationships, their composition, that is **the organisation of space**.

Having developed the idea of organisation in the decorated caves, and isolated the rules of association of the various motifs, Leroi-Gourhan pursued his spatial analysis

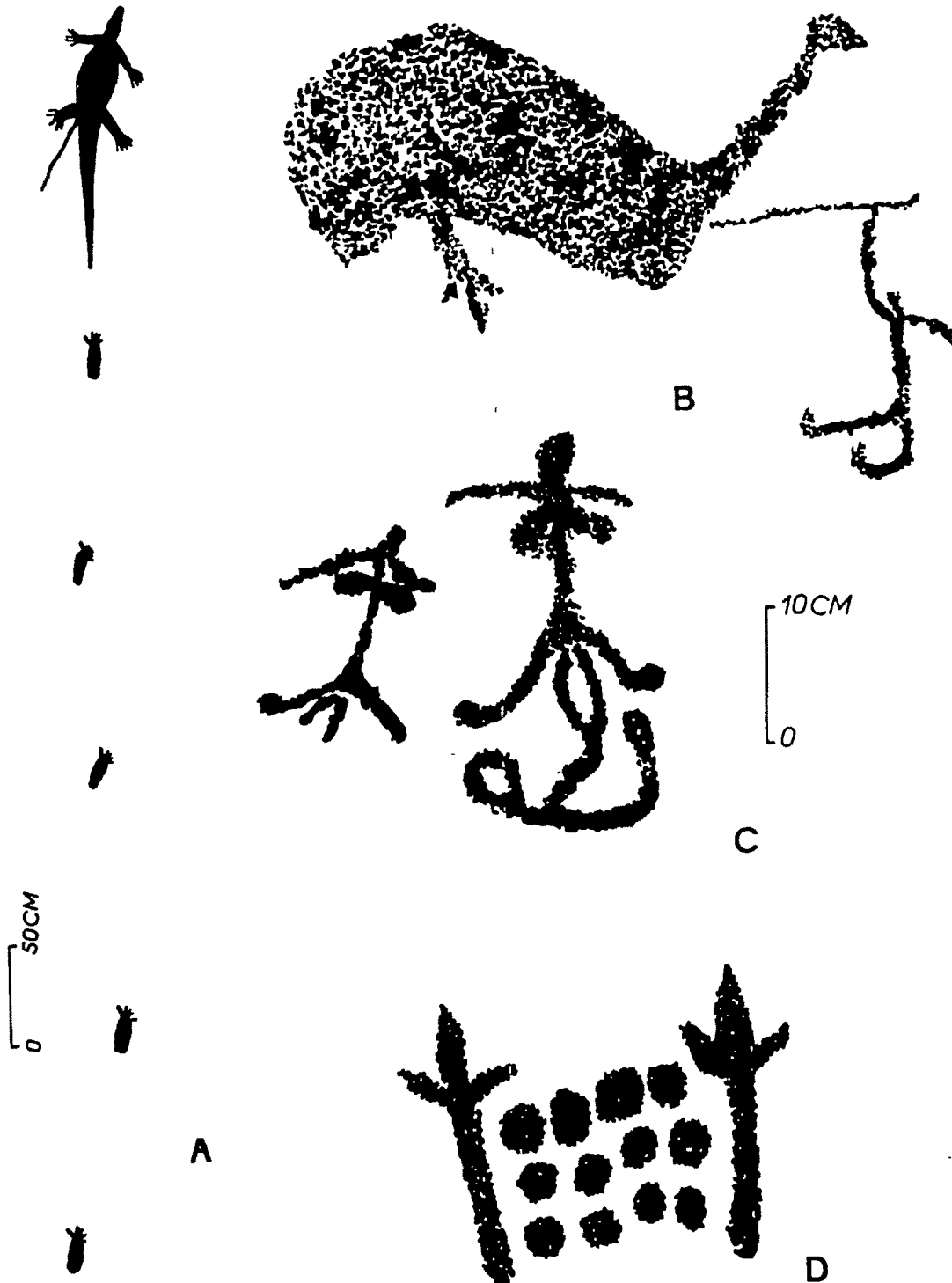
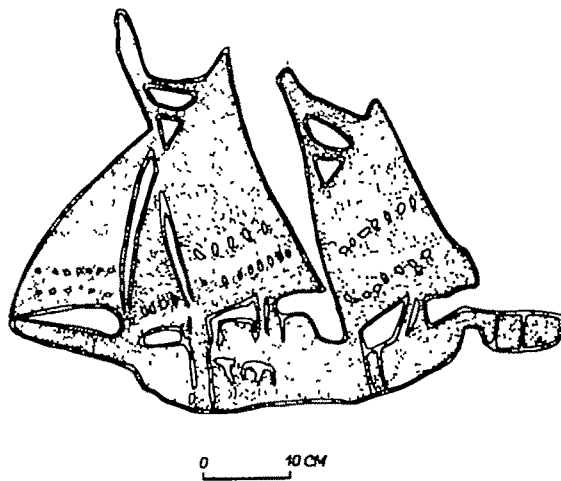


Fig. 11a: Scenes from Australian art: A = goanna hunting (red paintings, Emu Shelter, Laura, Cape York). B= emu hunting, engraving from Gum Tree Valley, Dampier (Western Australia). C= child birth (Gum Tree Valley, Dampier, Western Australia). (tracing by M. Lorblanchet). D= emu sitting on its eggs. The elongated print represents this, because the heels leave their mark on the ground.



and her fawn at Carriot, the row of *Megaloceros* in Cougnac or of "Antelopes" in the Combef, etc. One finds nothing of this kind in Australian art. Here, what is important to the artist is that all the constituent parts of the subject being depicted should be present on the surface to be decorated, but the order in which they are set out is only an aesthetic order. The only criterion of organisation is the pleasure of the eye. Although this art includes numerous scenes, for example, chronological order is not usually expressed through a graphic order. Many paintings, including bark paintings, represent mythological events, but the figures are not spatially connected to reproduce the unfolding of those

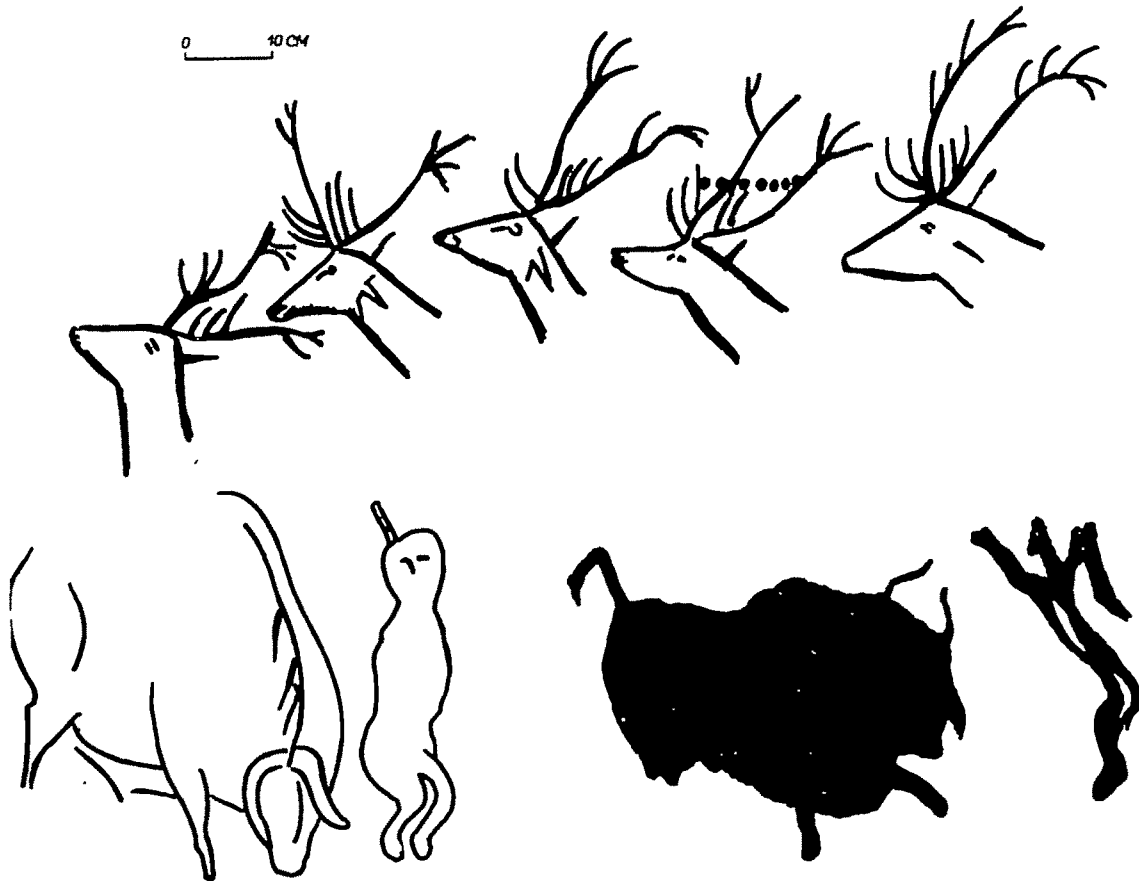


Fig. 11b: Above: red painting outlined in white, made towards 1930 in a shelter at Stanley Island (Flinders Archipelago, Eastern coast of Cape York). It represents a Japanese sailing ship ("luggar") dragging its dinghy, which was lying at anchor for *trepang* (sea cucumber fishing). The caldrons used for boiling the *trepangs* can be seen on the ship's deck (tracing by M. Lorblanchet). Middle: scenes of Palaeolithic cave art: frieze of swimming stags from Lascaux. Below left: from Roc de Sers "Man bearing something on his shoulder, chased by a bison". Bottom right: from Villars "Man with raised arms in front of a charging bison" (after Leroi-Gourhan).

into the aesthetic aspect of the figures. Hence he highlighted (1980: 520) the different kinds of Palaeolithic symmetry: "mirror symmetry", "mass" or "oblique symmetry". Among the numerous examples illustrating such observations, one might mention (for the Quercy) the animals of Pech Merle drawn back to back, the pair of ibex at Cougnac, the reindeer and its fawn at La Bigourdane, or the recently recorded doe

events. The motifs seem to float in space, and this floating space is purely ornamental.

An Australian painted surface cannot be read like a written page: it is a dazzling expanse that is taken in at a glance. This dissociation between the decor and its meaning causes the difficulties in interpretation revealed at Beswick Cave and Tindandjal by Macintosh. The link between the

figures is invisible, whereas some kind of structure sometimes shows through on the decorated walls of the Reindeer Age. The relationships between the figures and the stories that certainly went with them appear to have been different in the two cases. Whereas the Palaeolithic compositions seem to be dictated above all by their semantic content, one can say that Aboriginal myth is the "pretext" for a freer manipulation of colours, the organisation of which mainly obeys laws of form.

The same contrast between the Australian and Palaeolithic worlds can be found in the representation of time.

Forms and Time

Australian art is sometimes a narrative art but only rarely anecdotal. Although the decorative elements are generally scattered with no apparent order over the whole decorated surface, it comprises dynamic scenes.

Strictly speaking, it doesn't have naturalistic representations of original events; it does not tell extraordinary stories like comic strips or even the recent "biographical" rock art of the North American Indians (Kaiser 1986). Scenes in Australian art are symbolic and condensed representations of repetitive scenes in daily or ritual life: hunting, dancing, fighting, sexual relations, etc., rather than a particular hunt, battle or couple. The figures are ideas or themes rather than specific particular acts.

Hence, in a conventional, standardised way, hunting is evoked by the hunter being joined to a kangaroo or emu by his spear, or by the hunter plus his prints and his game, or by his prints alone heading for an animal wounded by spear, or even simply by an animal wounded with a line or a boomerang. Dancing is evoked by an often very simplified chain of people. McCarthy (1967: 18) has published engraved scenes from the Sydney region representing "Corroborees" (ritual dances), kangaroo hunts, and a curious "return from fishing" that is both symbolic and anecdotal and shows one man carrying three fish and another carrying a "bark canoe" (or some other object?). On the other side of the continent, the Dampier engravings (Western Australia) also include quite a lot of kangaroo and emu hunts, fights, dances, and men climbing up tree-trunks; the author has even recorded a birth-scene that is very conventional and expressive despite its extreme stylisation, since it comprised "stick figures" (Fig. 11c). Moreover, throughout Australia there is a strange contrast between the apparent schematism and stiffness of these "stick-men" one finds everywhere and the impression of frenzied life they sometimes express through their arrangement on the rock-surface and the positions of their arms and legs, for example in the Cobar sites of western New South Wales.

Despite the rigidity that characterises the Panaramitee style because of its always very standardised signs and tracks, it is by no means bereft of dynamic figures: series of

tracks in a line represent a bird or kangaroo walking along. An emu sitting on its eggs is depicted by a group of dots between the two prints of its feet.

Scenes are particularly abundant in the northern part of the continent, among the Bradshaw figures (Kimberleys) and in Arnhem Land's "dynamic figure style". The latter includes a great number of small, very animated human figures who are running, throwing their spears, or carrying various objects. Many have their legs at stretch. The expression of movement is generally conventional. It is suggested by the stretched legs, the general posture of the silhouette bending forward, and by the very composition of the scenes which gather together subjects in a variety of positions. In some cases, however, there is a real decomposition of movement; bent knees and a correct position of the legs are an excellent representation of a race (Fig. 12). This intentional depiction of movement that characterises part of Arnhem Land's art should not be confused with another fairly constant feature of Australian art: the frequent graphic plasticity of human figures, whose limbs are unrealistically contorted with no figurative intent. These are simple drawing conventions which are also sometimes linked to destruction magic.

Human couples, or a man using his arms to protect two smaller figures representing wives or children, are known throughout the tropical zone. The presence of sexual scenes, sometimes very naturalistic and sometimes very schematic, is another particularity of Australian art. In the Pilbara they can comprise up to 8 or 9% of the human figures (Wright 1968: 58). Copulation is represented by the conventional projection on a plane of the partners. Homosexual scenes exist among the Dampier engravings.

Hence the expression of movement is more in evidence in certain periods and regions than in others, but it is present throughout the duration of Australian rock art — the recent X-ray paintings, although usually stereotypes, are not totally bereft of dynamism — and often schematism blends with the movement. It is important to stress that it is mostly the human figures that are represented in full action, whereas the animals, as a rule, are much more static.

The expression of movement and life is produced very differently in Palaeolithic parietal art. True scenes are exceptional: the swimming deer and the enigmatic shaft-scene of Lascaux, the "toreador" of Villars, the bison charging a man from Roc de Sers... According to Leroi-Gourhan, "the theme of the man and the bison is the only example of a Palaeolithic pictogram" (1974: 384). One can add a reindeer suckling its young from La Bigordane (Saint-Géry, Lot). The bison of the Altamira ceiling have given rise to a series of interpretations that see them as a "charging herd", "rolling in dust", "giving birth", or "dying".

Leroi-Gourhan estimates that in Palaeolithic art, animation is primarily individual. He thinks it can be

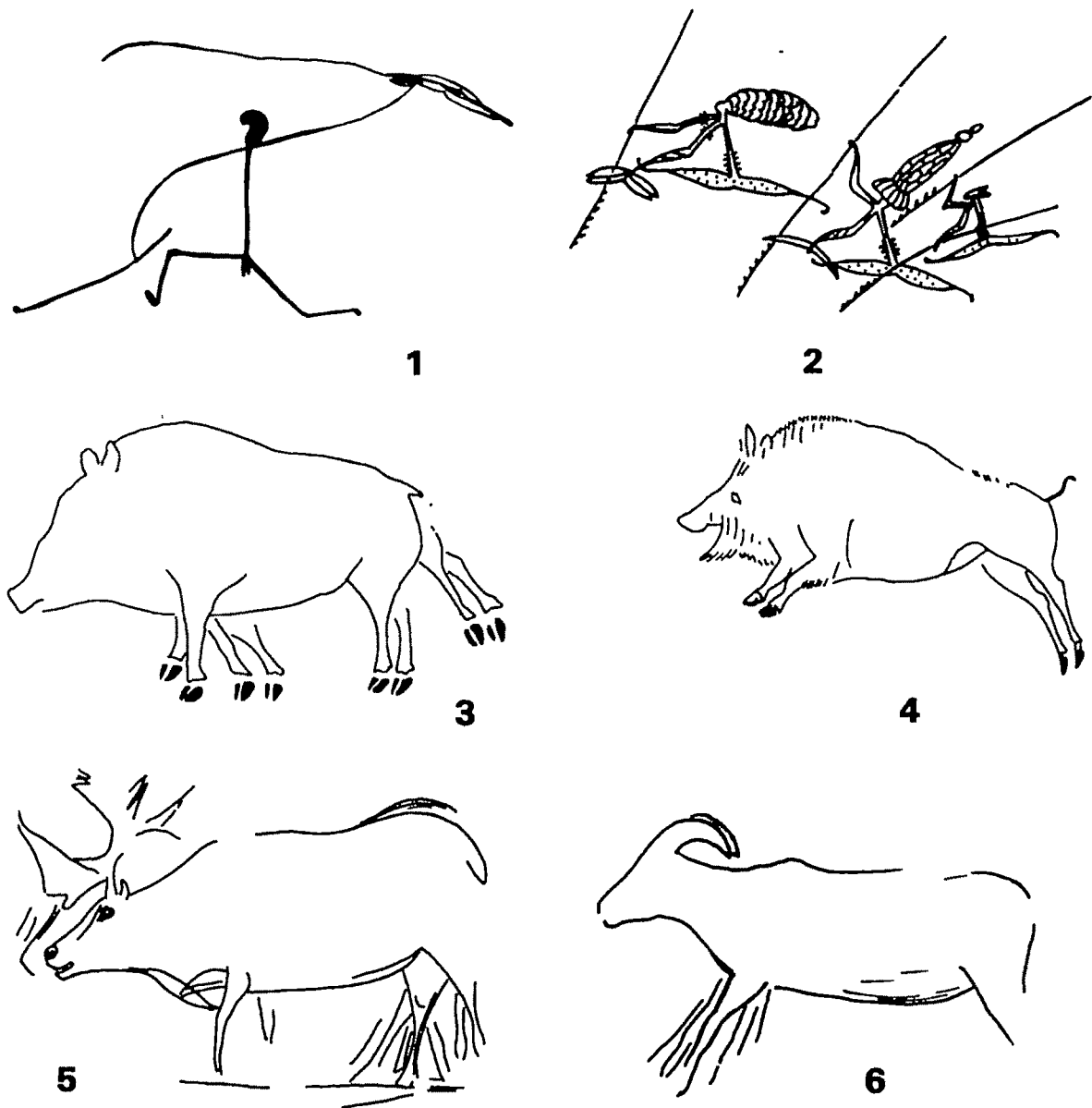


Fig. 12: Dynamic Australian and Palaeolithic art: 1 = red drawing (Mimi), High Valley of East Alligator Valley, Northern Territory, representation of a race, decomposition of the movement (after Brandl 1973). 2 = red drawing (Mimi), Deaf Adder Creek Region, Mt. Gilruth site 7 (Northern Territory) (after Brandl 1973). 3 = walking boar (Altamira after Breuil, painting). 4 = galloping wild boar (Altamira after Breuil, painting). 5 and 6 = engravings of reindeer and ibex with multiple legs from Sainte-Eulalie (Lot) (tracing by M. Lorblanchet). 7 = galloping reindeer, Sainte Eulalie (Lot) (tracing by M. Lorblanchet). 4 and 7 evoke the flying gallop, but the hind legs are still touching the ground. This is not the real flying gallop as in 2.

“symmetrical”, “segmentary” or “coordinated”. The art of Quercy provides a few examples: a horse in Les Merveilles standing on its hind legs, the forelegs thrust forward, recalls a horse in Font de Gaume in the same position. The spotted horses of Pech Merle are motionless, although they raise their forelegs slightly. The vertical or upside-down animals of Roucadour or Carriot pose a special problem: the stiffness of their outline and their limbs casts doubt on their being “falling” animals. Pech Merle’s Black Frieze ends on the left with a vertical aurochs cow. This is one of the very rare

“falling” animals that is “animated”, that is, its legs are not rigid. In fact, the position of the animal and its legs undoubtedly has other explanations: this figure is in a recess, behind a rock wall with a sloping vault where the only possible position for the artist was to stand at the side, with head bent downward. It is then entirely natural to draw an animal with its head downwards. The normal sequence of actions of the artist in this position explains the position of the subject, which was drawn sandwiched between other pre-existing figures. Most of the latter are in abnormal poses, the most

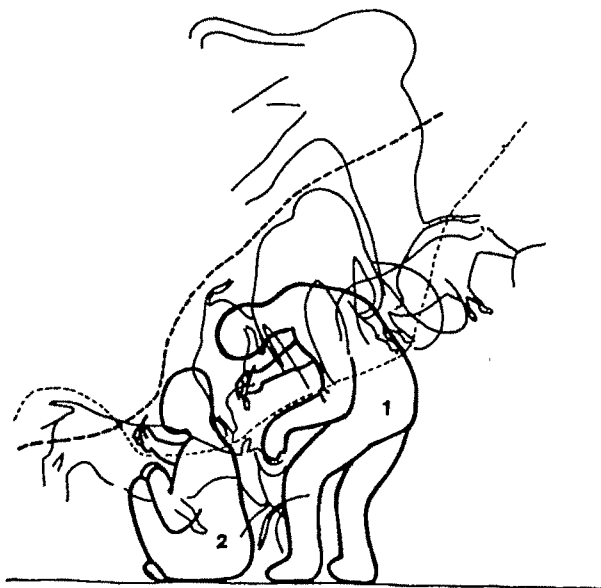
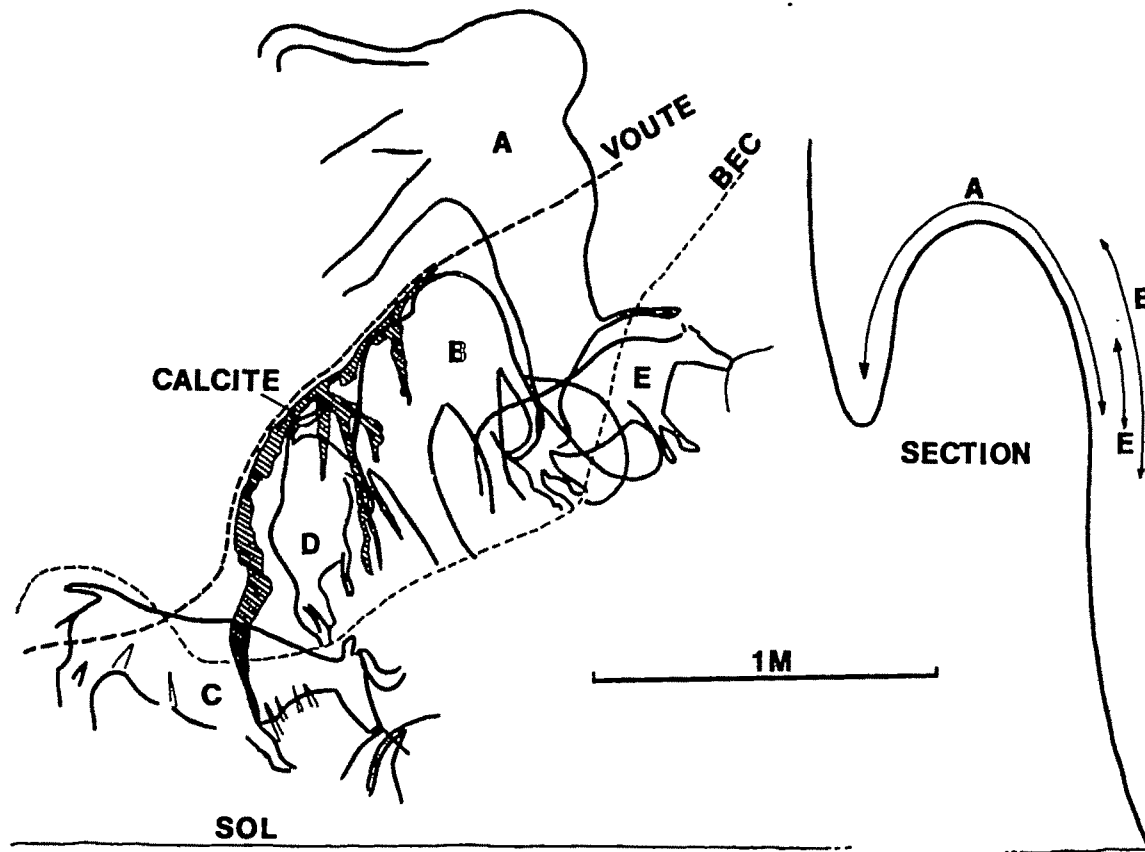


Fig. 13: Nook of the falling cow at the left end of the Black Frieze from Pech-Merle. The animals were drawn in the following order: A, B, C, D and E. The vault descends and affects the position of the animals which are vertically orientated here. The cow is wedged between two pre-existing figures (B and C), the vault and a concretion. On the right, postures of the artists drawing the falling cow (1) and the other cow (C) (2).

characteristic being a mammoth standing on its hind legs. Their abnormal posture is explained by the support's configuration and, especially, the general shape of this recess. Details such as these prove how plastic Palaeolithic figures are, and how they ignore the horizontal. All things considered, this is somewhat the opposite of true "animation" (Fig. 13).

On the same panel can be seen details symbolising life; lines coming out of all the animals' natural orifices represent bodily discharges in the same way as dots are used in the dynamic art of Arnhem Land to depict the voice or sweat of certain human creatures.

By contrast, in the cave of Sainte-Eulalie, an engraved reindeer presents a fine example of animation through multiple outlines. The seven versions of the hind legs break down the movement like in present-day comic strips. In this same cave the author has recorded another reindeer running with its legs at full stretch evoking a "flying gallop" like the boar of the Altamira ceiling (Fig. 12).

The "flying gallop" is rare in Palaeolithic art, and by no means characteristic. In Australia, one never sees it on animal figures, whereas it is quite common in human figures. It is found on both animals and humans in the Sahara, Spanish Levantine art, and in Cretan and Mycenaean art. The Near East, the steppes of Central Asia, Iran, China, etc., all provide typical examples, but there it is primarily horses that retain this convention. Reintroduced into Europe



Fig. 14: Pleistocene engraved human faces: 1 to 7 = La Marche shelter (Haute-Vienne, France), Magdalenian III (after L. Pales; Airvaux and Pradel 1984). 8 to 10 = Australia, Cleeland Hill (after Edwards 1966). 11 = Dampier (after Dix).

in the 18th century, the flying gallop seems to have had several independent centres of invention. Its existence in Australia, in an isolated world, proves that this representation of rapid movement is a universal convention. Nevertheless, the reindeer hunters, whose art is generally static, did not adopt it.

Conclusion

In order to assess the universality or diversity of the human

mind in time and space, it is first crucial to know whether, at their two ends of the world, the reindeer and kangaroo hunters independently became creators of forms at the same moment, if they experienced the same first graphic infancy, and whether their arts then followed the same evolutionary paths.

Some art historians, like René Huyghes (1957: 321) no doubt unfamiliar with prehistoric art, have seen the Palaeolithic's evolution of styles as a transition from ab-

straction to naturalism with a final return to abstraction. The study of Palaeolithic and Australian art reveals that this conception is quite wrong. For a start, in both worlds, two fundamental tendencies of the spirit of *Homo sapiens* stand out: the trend towards geometric schematism and abstraction on the one hand, and, on the other, that towards naturalism. These two trends are parallel, antinomical and synchronous. As for the precise evolution of styles, it will soon benefit from in-depth regional studies that will call into question the current chronological systems.

The motivations of *Homo sapiens* artists are undoubtedly more or less always of the same kind everywhere, but these creators differ in their way of grasping aspects of Nature. To reproduce the visible world, they often start out from the fundamental qualities of things, and their stereotyped symbols depict the essence of beings and objects, but they also strive to attain more superficial aspects such as volume, space, movement. We should note that, in this conquest of reality, the Australians took a different path to Palaeolithic people.

They rejected volume, did not represent depth, and turned towards ornamentation. Hence, the constructed space of the Palaeolithic contrasts with the floating space of Australia which is an ornamental space *par-excellence*. Perhaps the exuberant dynamism of certain Australian drawings is more of a simple playing with form, a simple means of obtaining new shapes by resorting to animation, than a faithful analysis of movement.

The reindeer hunters, on the other hand, achieved the third dimension. In so doing, they discovered almost all the graphic skills and knacks of European artists. The perspectivists of the Renaissance, *trompe-l'œil*... all start in the Palaeolithic. It was also at this time that the search began for perfection of line through a constant purification and idealisation of form, later developed in Greek art and throughout the history of western art.

The same opposition between an art of surface and an art of volume blossoms in the treatment of the human figure. Some of the Magdalenian faces of La Marche are not only drawings in depth suggesting the third dimension, but also real portraits, that is, an exact transposition of nature. These images reveal the emergence of the individual within Magdalenian society following the process of "individuation" described by psychologists (Virel 1965), whereas the kangaroo hunters, interested in an abstract idea of man, geometrised his image. As shown by the faces of Cleland Hill, probably contemporaneous with our Magdalenian, the first Antipodean artists played freely with human forms, considering them ornamental elements (Fig. 14).

A wide range of insights can therefore be obtained from studies of prehistoric art, to their great advantage. Despite its dangers and limits, which are more obvious than ever, the internal analysis of evidence remains the basis of

our research, but it can be illuminated by numerous data from outside.

The separation of analysis and hypothesis can now appear somewhat theoretical and illusory, because the latter does not always follow from the former, as Laming-Emperaire and Leroi-Gourhan wanted, nor does it necessarily precede it, as the New Archaeology's "hypothetico-deductive" method proposes. The art prehistorian entering a decorated cave cannot be compared to a "Martian entering a church"... He is not so neutral and foreign, but simply a man impregnated by cultural and thought processes of his time and his surroundings. Whatever his concern for objectivity, he inevitably applies his models, his ideas, his specific and implicit hypotheses to his study; this means that, fortunately, we never cease looking at prehistoric art in new ways.

In a symbiotic relationship, hypothesis and analysis back each other up, constantly growing in strength. "Exterior" models simply allow one to make the evidence undergo successive tests, multiple complementary verifications which, little by little, make its nature more precise and constantly expand its analysis.

Precise comparison, based on the ignoring of context and the assumption of a general, systematic analogy as practised at the turn of the century, must be abandoned today, although it was useful at one time. It reminded us that the "ethnographic present" starts with the appearance of Cro-Magnon man.

The ethnographic, archaeological and aesthetic comparison of these two independent but partly contemporaneous assemblages that constitute the kangaroo hunters' art and that of the reindeer hunters brings to the fore not laws but some general principles of human behaviour; it isolates not only universals, constants of artistic creation in hunting societies, but also significant differences. It is important to know about both of these, because in a sense Australian art also teaches us about the art of our own origins through its contrasts, and vice versa of course.

This approach is not limited to the study of prehistoric art, and the historians of the new French school have developed it splendidly. In the introduction to his magnificent last work, "The Identity of France", Fernand Braudel (1986: 15) defined his method by locating his subject in "the long term, the hexagon of territory, Europe, the world..." and declares: "France in retrospect presents itself like a laboratory for experiments, for "interspatial and intertemporal" comparisons, that can restore to us the perspective of continuities, of rules and trends (I don't say laws), or repetitions that make this in-depth history into a retrospective sociology that is, moreover, indispensable to all human sciences". Perhaps the time has come for prehistory to leave its isolation, and to feel, in at least some of its endeavours, that it forms part of this vast current "of a comparative history, a history in search of similarities" — and, of differences —

"the true condition of all social sciences" that the great historian has proposed and illustrated so brilliantly.

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Wheeled Vehicles and Mounted Animals in Prehistoric Indian Rock Art

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Abstract

This paper presents detailed evidence for wheeled transport and mounted animals as depicted in prehistoric rock art mainly from Central and Southern India. The author uses the technological innovations as well as the introduction of horse in rock paintings to suggest a relative chronology for rock art.

Introduction

The aim of this paper is to scrutinize the evidences for wheeled transport and of early mounted animals as shown in the prehistoric rock pictures of India.

Technological innovations shown in rock pictures can provide us with a relative time frame. This is particularly so when the introduction of a complex technology which has left its imprint on archaeological data in the form of material remains as well in the form of secondary evidences, like wheel-tracks, etc. In the case of wheeled vehicles the cultural implications are even more far-reaching, since the construction of chariots as machines of war and for the wealthy transport allows one to draw conclusions not only about the technical competence but also the social conditions of a society.

It is a matter of surprise, that chariots already appear in the earliest rock pictures of agriculturists and cattle keepers. In these pictures we do not see a gradually evolving, progressively more complex food-producing society, which one would expect after the long period of the food-gathering economy. Instead these pictures show a radical change of lifestyle with the introduction of domesticated animals which were used to draw chariots and carts as well as ploughs and were also ridden. In addition we see the progressive use of metal weapons.

As with all rock art in India, we do not have absolute dates which would indicate when this change in economy and technology was brought about, but only timeframes which are generally considered very questionable, and for that reason open to speculation.

Isolated depictions of the chariot in rock art had been noticed by some of the earliest explorers of rock shelters in India. The first chariot depiction described was the one Silberrand had seen near Banda (Silberrand 1907: 567-570). Archibald Carlyle, who already 40 years earlier was exploring Morhana Pahar in the Mirzapur District of Uttar Pradesh must have noticed the chariots depicted there. Although no record written by him survives the pictures from this site were published in several papers and articles by Bridget and Raymond Allchin (Allchin, B. 1958: 153-155, Pl. M a&b; Allchin, B. and F.R. Allchin 1982: 83, Fig. 4.12; Allchin, B. 1986: 139-156). The engravings of bullock carts in the Edakal cave (Fig. 44) in the Kozikode District of Kerala may have escaped the notice of Fred Fawcett during his visit in 1892 since he did not mention them in his article about his discoveries there (Fawcett 1901: 409-421), as also those in the Kappagallu Hill (Fig. 45) near Bellary in Karnataka (Fawcett 1892: 247-257). These were published by D.H. Gordon almost 60 years later (Gordon 1951: 117-119, Fig. 1f).

Cuthbert King found several engravings of carts on boulders close to the Indus River near Attock (King 1940: 65-68). These are also seen by Gordon, who also found a few engravings in this area (Gordon, M.E. and D.H. Gordon 1941: 197-221).

An important site where a number of chariots appear in the rock pictures was noticed by M.G. Dikshit during his explorations in the Mandasor District of Madhya Pradesh (Dikshit 1957-8: 25, Fig. 15). This site, named Cibbar Nullah (Figs. 27, 30-32), lies in the vicinity of several other sites which were explored by Abid Ahmed Chowdhury and



Fig. 1: Raisen-Ramchaja; Painting in red; Average length of the draught animals 20 cm

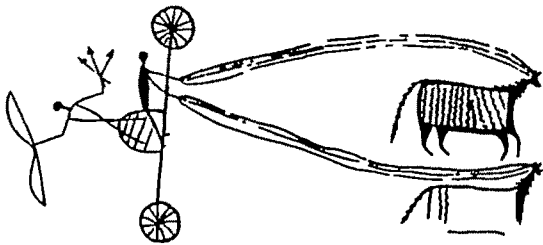


Fig. 2: Kathotia; Painting in red;
Length of the animals 15 cm

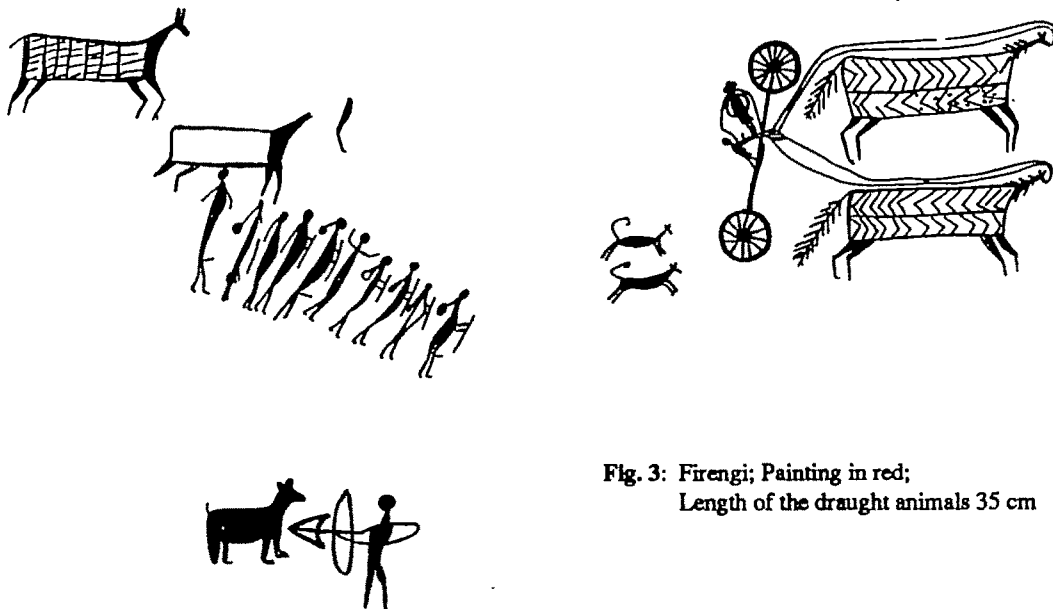


Fig. 3: Firengi; Painting in red;
Length of the draught animals 35 cm

Ramesh Pancholi during the early seventies and also yielded a large number of chariot depictions (Fig. 24-26, 29, 57, 59) (Neumayer 1983: 129).

Several paintings of chariot were also noticed by Giriraj Kumar in Kanjadei and Kapildara in the Parbati Valley near Baran in the Kota district of Rajasthan (Fig. 34-35). A depiction of a chariot was also found at Patsal near Fatehpur Sikri (Fig. 53) (*JAR* 1963-64: 91).

About half of all the known chariot and cart depictions were found in the extensive rock art region in the vicinity of the city of Bhopal. This area was explored thoroughly after the discovery of the painted rock shelters in Bhimbetka (Fig. 1-15, 17-23, 40-42, 51, 54-56, 65).

In the southern Deccan representations of wheeled vehicles were rarely found in rock pictures. Besides the already mentioned ones from Edakal and Kappagalu (Fig. 44-45), an isolated chariot figure drawn by bulls was found in Maski (Fig. 43). Figures of carts are known from the Benakal region (Fig. 49) in the Raichur district of Karnataka, in Hiregudda (Fig. 46) near Badami in the Bijapur District, and in Yerdanur near Hyderabad in Andhra Pradesh (Fig. 47-48).

At the northern limits of the Indian subcontinent, illustrations of chariots were found recently at the site of Thor, close to the city of Chilas in Pakistan (Jettmar and Thewalt 1985: 13).

In the present analysis we have to make a distinction between, on the one hand chariots which are light-weight vehicles for war, and on the other hand the status transport vehicles, generally pulled by horses, but in rare cases by bulls or oxen, as well as carts which are more heavily constructed, invariably pulled by cattle, and which probably served to transport loads.

It is remarkable that more than half of the chariots shown in rock art are not drawn by bovines, but by animals who though not clearly identifiable as horses, are in fact, horses since similar animals are shown being ridden as well.

The constructional features of the chariots are not depicted uniformly, so that we can presume that several types of chariots existed simultaneously or successively.

The chariots have two wheels on either end of a single common axle. Some depictions show a platform, which a central pole shaft connects to the invariably straight yoke (Figs. 9-11, 16, 24-25, 36, 46, 53), which rests on the neck of the draught animals. These are yoked in pairs or in double pairs, so that there is an equal number on either side of the yoke with the pole between them.

Another type of chariot shows two or more poles, which run parallel from the axle towards the yoke and so form a platform of which only the part before or immediately behind the axle was used by the crew to stand on (Fig. 1, 17, 27-32).

A large number of chariots, particularly those of the earliest stylistic group where chariots appear, do not show pole shafts or yokes at all. Quite often an odd number of draught animals are shown, connected to the wheeled part of the vehicle only by the reins which are held by the charioteer, who sometimes stands on a semi-circular platform, but often has no more to cling to than the axle between the wheels. It is not clear how to interpret these technically inaccurate or incomplete depictions (Fig. 2-8, 12-15, 18, 21-23, 26, 34-35).

The wheels of the chariots are obviously spoked (Fig. 2-8, 11-12, 14-16, 18, 21-28, 30-36, 41-43) and the number of spokes vary between 4 and more than 10. The spokes are generally shown radially emanating from the centre of the wheel and only in one case are they indicated pair-wise tangentially to the axle (Fig. 5). In none of the prehistoric chariot depictions are axle pins indicated, nor has the author found any indication of a hub in the drawings of chariot wheels.

This absence of axle pins may indicate a rotating axle. The absence of a hub may indicate that the spokes were set directly into the axle, or in the case of the pair-wise — parallel spokes, that the axle was encased by the spokes.

Due to the schematization of the depictions the wheel size cannot be ascertained. In case the axle was a rotating one, the radius of the wheels would have to be kept as short as possible to minimize the impact of angular forces on the spokes so as to prevent the warping of the wheels. Incidentally, a rotating axle is also a feature of the Daimabad copper chariot (Dhavalikar 1982: 361-366).

The superstructure of the chariot is basically a semicircular, oval or triangular shaped platform, which must have been elevated over the axle and is shown in the paintings sometimes towards the back of the axle and sometimes in front of it (Figs. 1-2, 9-13, 16-19, 22, 24-25, 28-36, 40-42, 53).

On account of the birds-eye-view in which most chariots are portrayed, the chariot's superstructure is difficult to reconstruct. Only in one depiction is the platform shown elevated above the wheels (Fig. 9).

None of the depictions give a clear picture of the bearing-struts, through which the axle was threaded or which encased the axle. On the Daimabad chariot these struts are holed planks fixed on either side beneath the platform.

In only two representations of chariot can we recognize banisters or hand pairs in front of the upright standing charioteers. These guards were most probably necessary to lend support against the obviously considerable jerks the charioteer had to suffer in a fast moving vehicle (Figs. 9-10). One banister is shown T-shaped, the upright being supported by an obliquely placed strut set into the pole shaft, which indicates that the tractional forces were relayed via the pole-

shaft and the superstructure of the chariot. Another example of a guard shows a curved upright stake which the charioteer could hold on to (Fig. 10). Incidentally, the copper chariot from Daimabad is also equipped with a rather fragile looking guard, which is strengthened by a pair of obliquely placed struts leading from the upper side of the banister towards the figure of a dog, which is cast over the central socket into which the pole is set.

The yokes of the chariots in rock art pictures are always no more than a simple cross bar at the end of the pole shaft (Figs. 10-11, 16, 24-25, 36, 40-42, 53) and they rest on the necks of the draught animals. In none of the yokes do we see any attempt at decoration or curvature to fit better the anatomy of the horses. The reins generally lead pair-wise from the hands of the charioteer over the heads of the animals towards the tip of their muzzles (Figs. 3-7, 11-12, 14, 18, 21-22, 24-26). This seems to be a strong indication that the horses, as well as cattle, were controlled by a piece of wood or rope threaded through the nostrils.

The double rein-strands allow for a left and right pull. In one instance only one pair of reins (Fig. 11) is shown to control a pair of horses. This would have been possible by knotting the left and the right strands together, so that a single pull would force both horses simultaneously in the same direction. This arrangement would need some mechanism to prevent the interlinked strands from getting entangled, but nothing of that kind can be made out in the paintings. The looped ends of the yoke of the chariot from Daimabad could have served this purpose.

The charioteers are standing on a platform, which in most cases is depicted without a banister or hand rail. The placing of the charioteer caused considerable difficulties on account of the current accepted perspective conventions, which did not allow foreshortening or overlapping.

In most cases the chariot crew is shown "flattened out" from the axle backwards (Figs. 2-3, 8, 13-14, 18, 23-29, 31, 33, 36, 43). In other cases the charioteer is placed somehow or other along the axle, but slightly slanting backwards, so as to not overlay the wheel. In yet other instances he is seen standing upright on the pole slightly in front of the wheel (Fig. 11).

In many of these chariot paintings which show the vehicle stripped of almost all necessary features except wheels and axles, the charioteer clings to the axle without any further space to place his foot and is linked to the draught animals only by the reins (Figs. 2-6, 8, 13-14, 21, 26).

Most of the chariots are manned only by a single charioteer (Figs. 4-6, 9-11, 13, 31, 33, 40, 43). In a few cases he is accompanied by an armed warrior (Figs. 2-3, 8, 14, 24-28, 36), and in one case there are three persons standing in one vehicle (Fig. 29). Many chariots are shown with no crew at all (Figs. 1, 12, 15, 17, 22, 32, 34-35), while several

chariots are shown being led by grooms walking in front of the animals and holding them by the reins (Figs. 25, 26, 32, 37).

As the stylistic convention of the times did not allow for foreshortening, the chariot depictions appear as if in 'birds-eye-view', in which the wheels and the position of the animals had to be twisted and portrayed in a strict side view. There are several different variations of this general convention. The draught animals are seen either standing upright on either side of the pole where the animal further away from the viewer is positioned on top of the nearer one (Figs. 1-8, 10-11, 13-15, 17-18, 21, 26, 34-35, 37, 39-40, 42), or all animals are placed in such a way that their backs are towards the pole, with the animal further away from the viewer shown upside down (Figs. 16, 24-25, 27-29, 31-32, 38, 43, 49), or all the animals on either side of the pole are depicted with their legs towards the pole (Fig. 36).

The first example mentioned above comprises the chariot depictions at sites in the surroundings of Bhopal. The second are typical of the depictions of chariots and carts in the Chambal region, but were also observed in depictions from the southern Deccan (Figs. 43, 46, 49).

In one depiction from Firengi the conventionalized "birds-eye-view" was substituted by yet another type of portrayal of a chariot. Here the vehicle is shown in side view, but the vehicle's wheels are positioned at one level in the direction of traction, i.e. one behind the other (Fig. 9). This depiction allows one to understand to some extent, the details of the chariot's superstructure, besides being the only clear portrayal of a chariot's hand rail. Only a single depiction of a bullock cart from Yerdanur is shown departing from the generally observed conventions of perspective. It shows the cart in strict side view and both draught oxen as standing hindquarter against hindquarter before (below) the cart (Fig. 47-48).

Charioteers and/or accompanying warriors are armed with bows and arrows (Figs. 2, 4, 6, 18) and axes (Figs. 18, 24-25, 27-31) and in one case a warrior is holding a spear (Fig. 29). Swords and shields appear in scenes where chariots are shown, but they are never held by the chariot's crew, only by the accompanying foot-soldiers (Fig. 18).

Several picture groups which can be interpreted as fighting scenes include chariots, foot-soldiers and horse-riders positioned against each other (Figs. 18, 21).

The flanks of the chariots in these fighting scenes are generally protected by several foot-soldiers (Figs. 18, 21) armed with axes (Figs. 21, 24, 27), and in one case also with a sword and shield (Fig. 18).

The chariot depiction from Morhana Pahar, which shows a quadriga surrounded by people armed with bow and arrows was interpreted by Bridget and Raymond Allchin as the way-laying of a chariot (Allchin, B. and F.R. Allchin 1982: 83, Fig. 4.12).

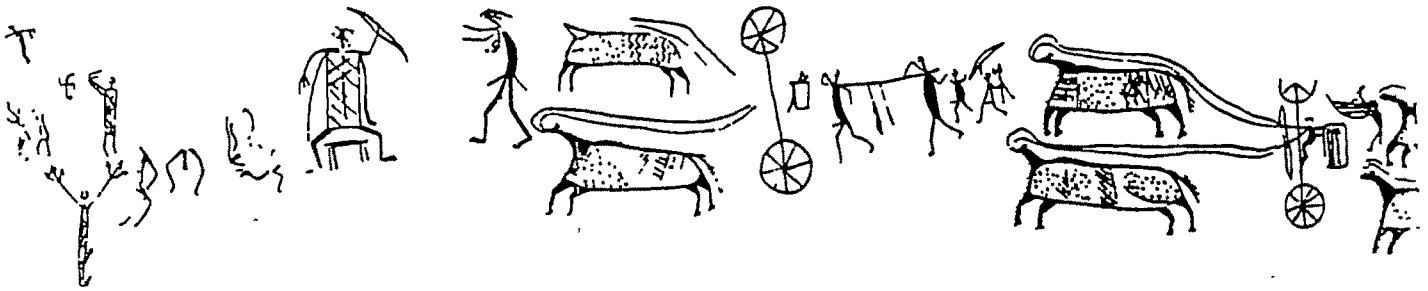


Fig. 4: Jaora; Painting in red;
Length of the draught animals 30 cm



Fig. 5: Kathotia; Painting in red;
Length of the draught animals 25 cm



**Fig. 6: Firengi; Painting in red;
Length of the draught animals 45 cm**

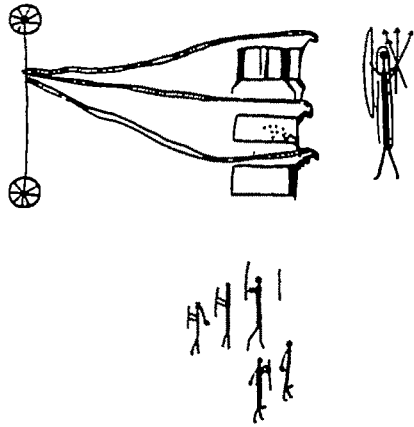


Fig. 7: Firengi; Painting in red;
Length of the draught animals 10 cm

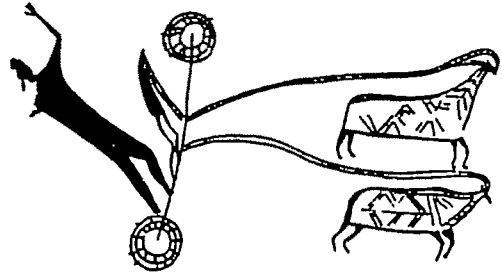


Fig. 8: Bhopal-Dharampuri; Painting in red;
Length of the draught animals 15 cm

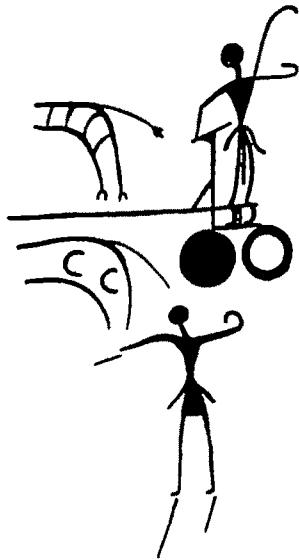


Fig. 9: Firengi; Painting in red;
Height of the charioteer 10 cm

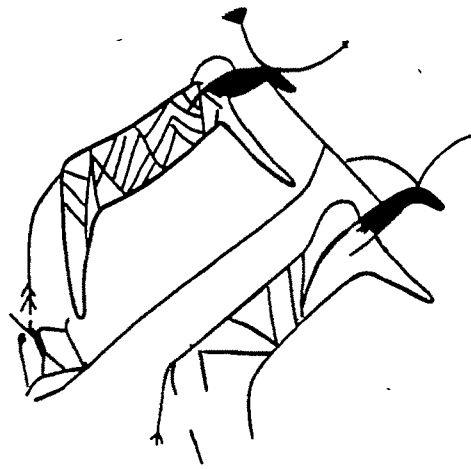


Fig. 10: Gelpur; Painting in red;
Length of the draught animals 25 cm

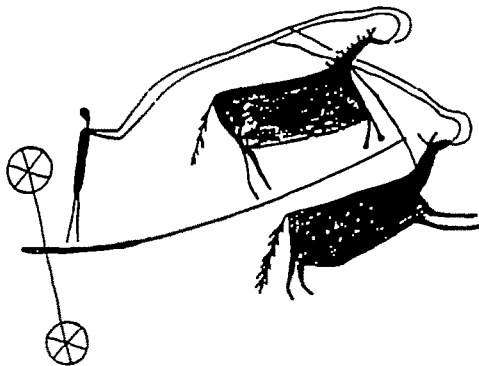


Fig. 11: Putli Karad; Painting in red;
Length of the draught animals 20 cm



Fig. 12: Firengi; Painting in red;
Length of the animal 10 cm

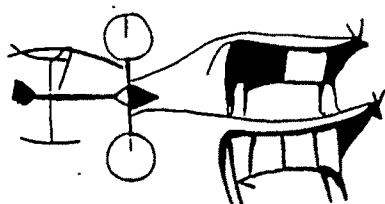


Fig. 13: Urden; Painting in red;
Length of the draught animals 30 cm

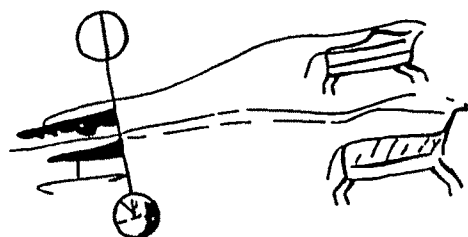


Fig. 14: Firengi; Painting in white;
Length of the draught animals 15 cm

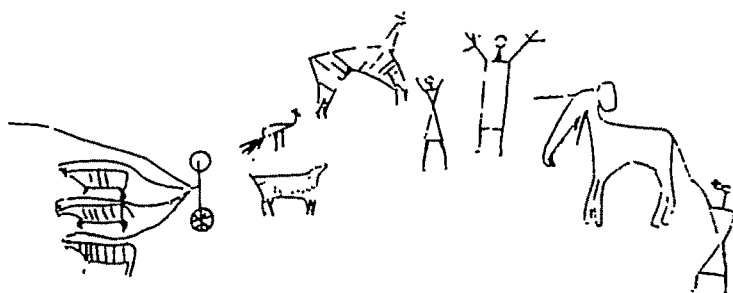


Fig. 15: Jaora; Painting in red;
Length of the draught animals 10 cm

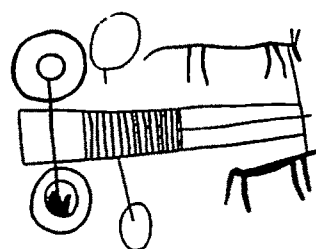


Fig. 17: Narsinghgarh-Kotra; Painting in red;
Length of the chariot 25 cm

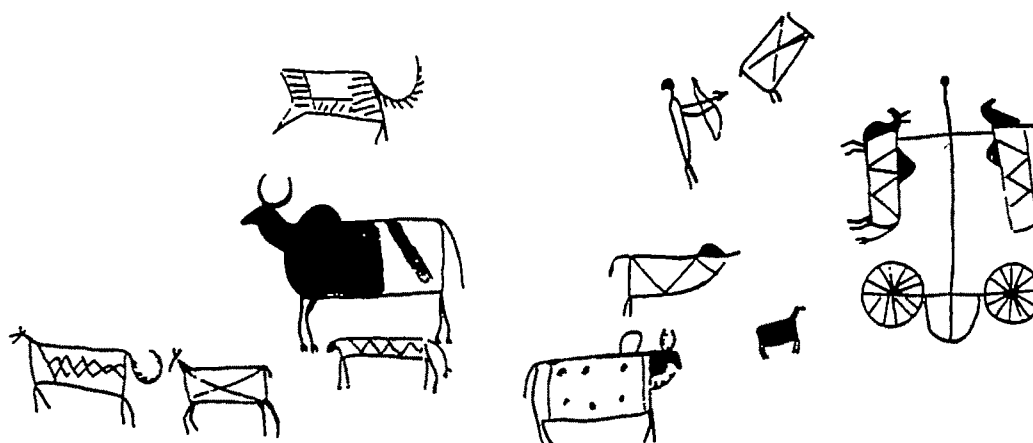


Fig. 16: Abchand; Painting in red; Length of the chariot 16 cm

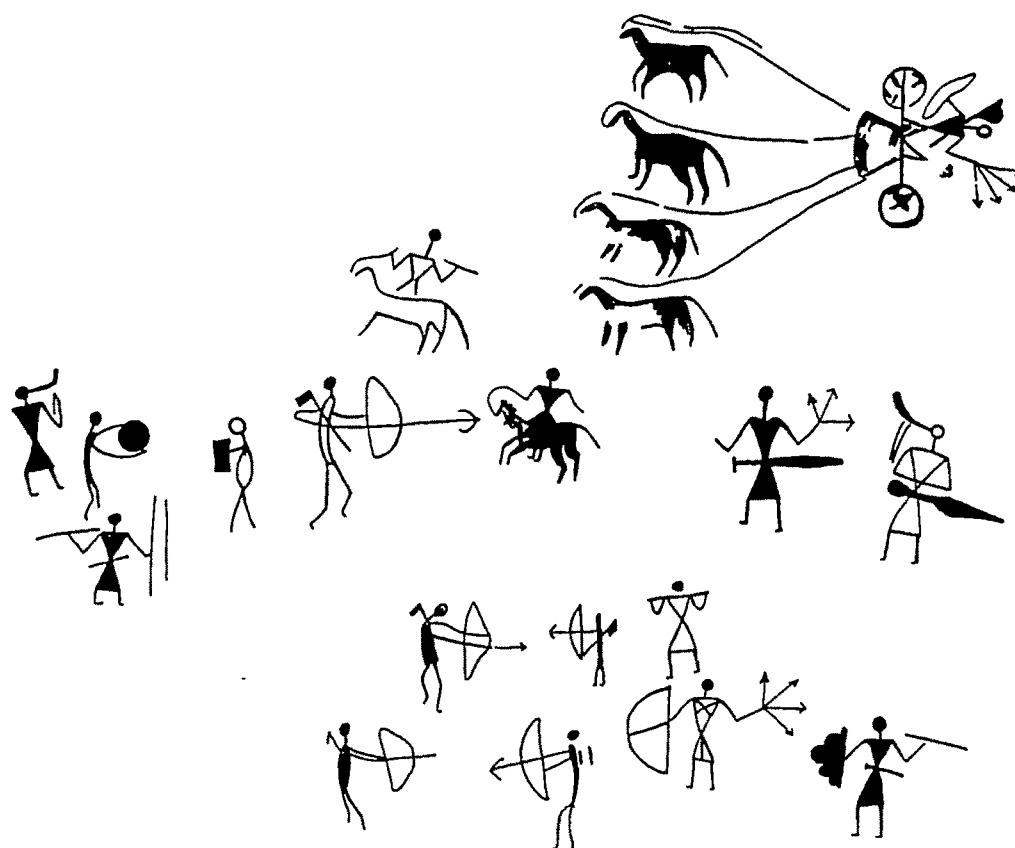


Fig. 18: Firengi; Painting in red; Length of the draught animals 10 cm

Fig. 20: Firengi; Painting in red;
Height of the left person 10 cm

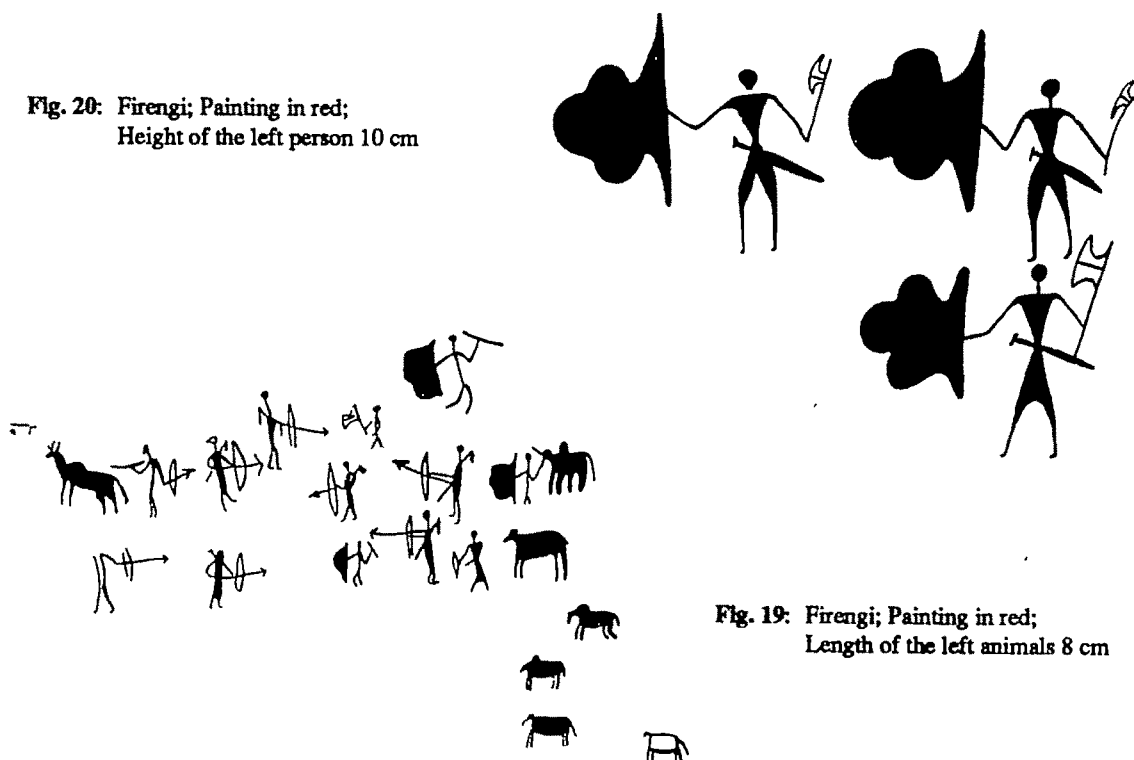


Fig. 19: Firengi; Painting in red;
Length of the left animals 8 cm

Among all these fighting scenes not a single one shows chariots being positioned against each other. These scenes of warfare show that chariots were not used as fighting-platforms, but that the crew while fighting dismounted from the vehicle (Fig. 21).

The chariots also have to be seen as status-appropriate means of transport of socially elevated persons to reach the battlefield.

The charioteers and/or warriors are never seen holding their weapons in a "fighting position", but rather present them like standards (Figs. 2, 18, 24-25, 27-29, 31).

It is not clear on whose side the sympathy of the painter lies. Only in one case do we see a chariot which is obviously overcome, the charioteer lying on the ground, his weapons scattered, while above him a file of armed men are marching, the leader holding an axe in front of him (Fig. 23).

Another group of procession scenes, where chariots occupy a central position are of obviously theatrical character and most probably have to be understood in a cultic context (Figs. 4-6).

In these procession scenes we see load bearers, harp players, ithyphallic dancers, acrobats, boxers and persons distinguished by small seats between their legs (Neumayer 1983: 128, 130).

Procession scenes with ithyphallic men are not altogether rare in the paintings of the early agriculturists and animal-keepers (Neumayer 1983: 128, 130).

The weapons depicted in these chariot procession scenes are bows and arrows. The latter are carried in quivers, while the bow is held along with the reins in both hands (Fig. 4). The arrowheads are generally of a tanged type (Figs. 4, 6). Microlith — set arrows are not shown in pictures in which chariots appear, although such arrows are known from pictures of the same stylistic group.

Axes frequently appear in chariot-related scenes, although in the Vindhya region these depictions clearly do not belong to the earliest stylistic picture groups in which chariots appear. The shapes of these axes are comparable to axe shapes known from copper hoards. They show side edges and a curved cutting edge (Figs. 18-19, 21, 23). Smaller axes of unspecific shapes are carried by bow-men in several fighting scenes (Figs. 18-19).

Another weapon which appears in scenes with chariots are clubs which sometimes are weighted by ball-shaped heads (Figs. 1, 3, 7). This weapon is only known from the very earliest style of paintings of the agriculturists and animal-keepers and is only found at sites in the vicinity of Bhopal. Clubs are never held by the chariot crew. Only in the later chariot-related groups do depictions appear of swords and shields carried only by foot-soldiers (Figs. 18, 20), except in the case where an elephant rider is armed with a rather heavy dagger or sword (Fig. 79).

The author defines those vehicles as bullock carts whose superstructure consists of a triangular frame, of which the shorter side rests over the axle, while the two longer sides meet at a sharp angle which rests over the yoke. The platform thus formed is sturdy and fit to carry heavy loads. Carts are exclusively drawn by yoked cattle (Figs. 36-39, 44-45, 47-49).

Bullock carts are rarely depicted in rock pictures. Only about ten examples are known to the author, and surprisingly none of them is shown loaded, nor has any of these a driver sitting on it.

Only in a single painting is a man leading the yoked pair of cattle while walking in front of them (Fig. 37).

The wheels of carts are depicted similarly to those seen in chariots and are shown at both ends of a common axle. In most of the earlier examples no spokes are indicated (Figs. 36-37, 39, 45, 49). The wheels are either left blank or filled in with pigment. Only in the cart depictions from Edakal (Fig. 44) and from Yerdanur (Figs. 47-48) are spoked wheels shown. The author takes this to be a clear indication that cart wheels were mostly constructed differently from those of chariots. The cart wheels were most probably constructed of joined planks, forming a massive circular wheel.

As in the chariot depictions the axle is never drawn over the centre of the wheels, nor are axle pins shown. The single exception to this observation is a painting of a cart found in the Mahadeo Hills and belonging to the Historic period (Fig. 39).

The draught animals yoked under the straight yoke are invariably cattle. In one case the animals are portrayed as being held in place under the yoke by pegs, which are fixed pair-wise on either side of the yoke (Fig. 37).

A differently constructed cart is shown in the rock bruising in the Kappagallu Hill. The cart there consists of a square compartmented platform, which is joined to the yoke by a central pole (Fig. 45). The wheels in this example do not have spokes either, but the axle ends in small solid circles in the centre of the wheels, indicating a hub.

The square shape of this chariot conforms to the cart frames of clay and other material which were found frequently in urban Chalcolithic settlements.

In one painting found near Pahargarh in the Asan River Valley, a chariot and a bullock cart appear together. In this picture the distinctive portrayal of the wheels of different but contemporaneous vehicles are obvious (Fig. 36).

The plough is another animal drawn artefact, which one would expect to find in the paintings of agricultural societies. It is a matter of surprise that only two paintings of people ploughing have so far been found in the huge body of rock art in India (Figs. 50-51), despite the fact that this important agricultural operation is also known to have been

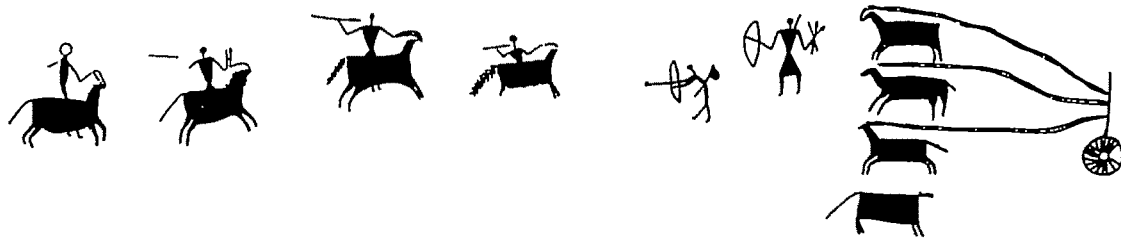


Fig. 21: Firengi; Painting in red; Length of the draught animals 12 cm

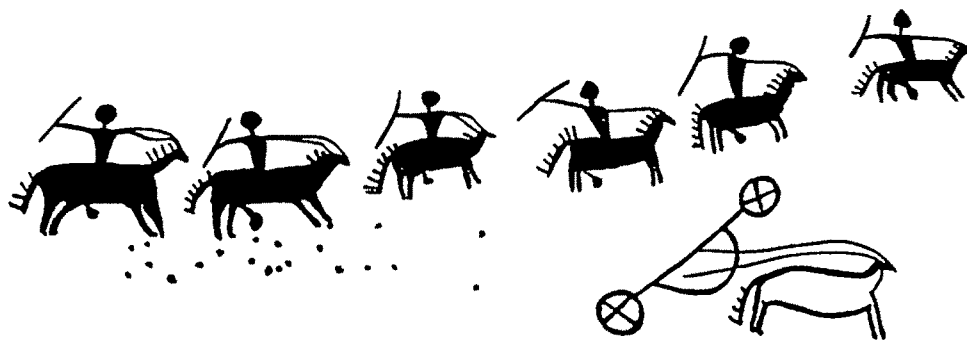


Fig. 22: Kathotia; Painting in red; Length of the animals 20 cm



Fig. 23: Gelpur; Painting in red; Average length of the standing figures 10 cm



Details from Fig. 23

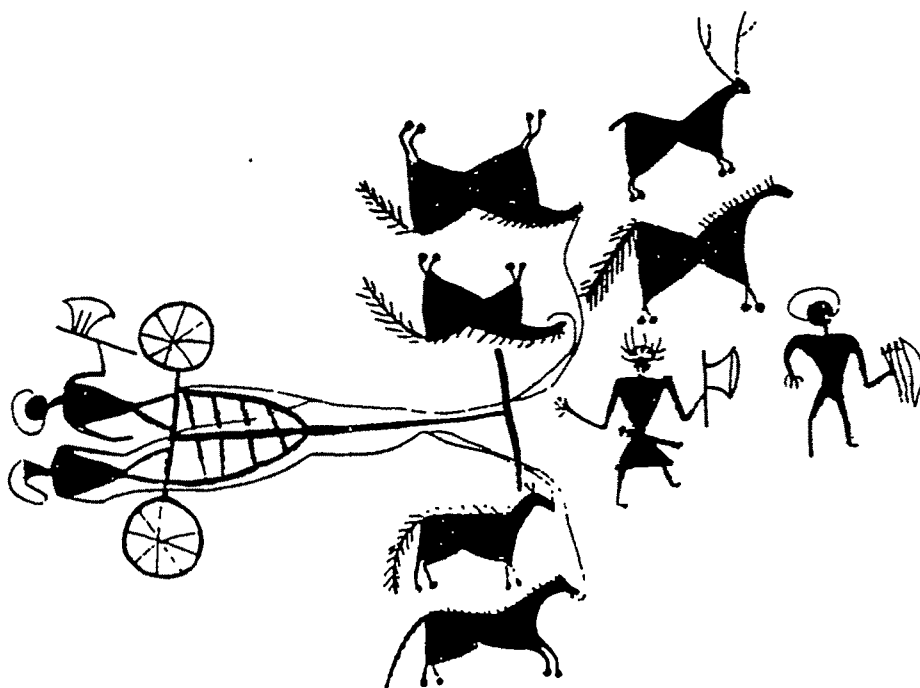


Fig. 24: Chatur Bhoj Nath Nulla; Painting in red; Length of the draught animals 7 cm

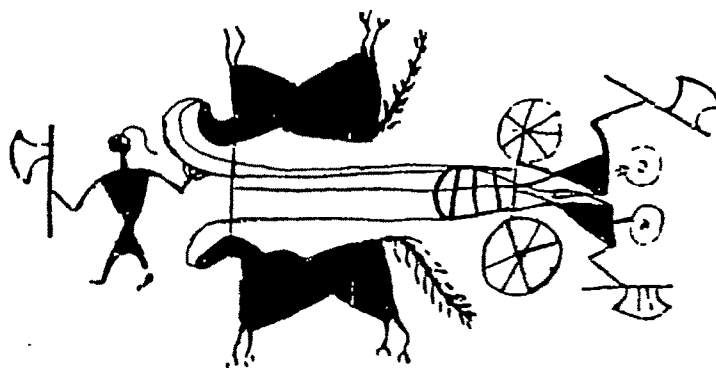


Fig. 25: Chatur Bhoj Nath Nulla; Painting in red; Length of the draught animals 8 cm

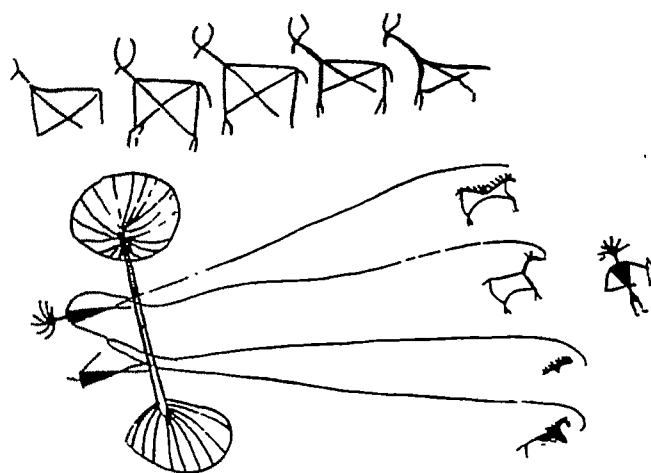


Fig. 26: Katria Kund; Painting in red; Height of the standing person at the right 5 cm

connected with a much ceremonial attention, as it still is in India.

One painting showing people ploughing is detailed enough to enable the recognition of the constructional features of the ploughs. This picture (Fig. 50) shows two ploughmen walking behind their pair of yoked oxen which are pulling the plough. The form of the ploughs correspond in virtually every detail with those still used all over India. The ploughs consist of a shorter sole-piece and a slanting upright, into which the pole shaft is set. The upright part is fitted out with a short handle to keep the plough steady. The pole shaft joins the yoke which rests on the necks of a pair of humped cattle. The ploughmen hold the reins, leading singly towards either animal and ending at their necks, with one hand, while in the other hand they hold a staff or goads. Although this picture is quite detailed, the pole shafts are shown as far too long to enable the ploughmen to control the animals. This obviously incorrect depiction of size relations in rock paintings should serve as examples to demonstrate that size relations in rock art only rarely allow a clear picture of the actual size relationship of implements.

The second depiction of a man ploughing occurs at the site of Lakjaoar (Fig. 51). This picture, although belonging to a Historic stylistic group, is interesting because besides the plough and the draught animals, the furrowed field is also shown in the form of a ruled square. Here as well the plough is a knee-shaped stake attached to a pole which is connected to the yoke. The yoke shows three bow-shaped attachments.

Agricultural implements are also shown in paintings found at the site of Noisaillana Gudda near the Vitala temples in Vijayanagar (Fig. 52). These pictures show ploughs with dentition, similar to the harrows still used in this area.

Within the same stylistic groups of pictures in which chariots and carts appear for the first time, we also find the earliest examples of animals being ridden. These examples are only of cattle with men astride (Figs. 54-56) but it is likely that representations of horse riders might be more or less contemporary, although they are extremely rare in the earlier stylistic groups of pictures of the agriculturists and cattle-breeders (Figs. 18, 21-22, 50, 64-67).

The earliest riders on cattle are found in pictures at the site of Firengi (Figs. 54-55) in the hill ranges south of Bhopal and from Makoriya (Fig. 56), a site on the banks of the Betwa River 30 km southeast of Bhopal.

One painting shows the rider standing on a humpless bovine, controlling the animal with a pair of reins (Fig. 55). The other example from Firengi shows a humped bovine and here as well the rider controls the animal with a pair of reins. In front of this animal is the figure of a man encircled by a line (Fig. 54).

Men standing on cattle are also known from paintings at the site of Adarshila in the Mandasor district of Madhya Pradesh, where in one scene (Fig. 58) three persons armed with axes are standing on bovines surrounded by small figures of cattle and several other persons similarly armed with axes.

Another picture from the same site shows an armed rider on a bull standing in front of a chariot (Fig. 28).

In Chatur Bhoj Nath Nullah there are two rather diminutive persons perched on the back of a bull, which is being led by a third person (Fig. 59).

It is rather tempting to interpret these pictures as cult-icons (Figs. 28, 54-59) showing deities riding bulls, or as transmigration scenes since it is unlikely that bulls were ridden as a general mode of transport or even as mounts during war.

Pictures of people standing behind animals whose use as mounts is out of the question, also appear in the rock engravings of Ladakh. For example, one scene depicts a man standing under the splendid curves of the horns of an ibex and goats (Fig. 63).

In the rock paintings of the southern Deccan particularly there are a large number of pictures showing men standing behind bulls (Figs. 60-62). In these paintings the cultic context is even more obvious, especially in those scenes where copulating couples are seen standing on bulls (Fig. 62).

Although it seems that horse riding is not depicted in the very earliest stylistic group of the period, yet horse riders already appear in some of the earliest stylistic groups of the art of agriculturists and cattle keepers.

Since some of these earliest depictions of horse riding are only of isolated figures their stylistic affiliations cannot be ascertained (Figs. 64-66).

The figures of horse riders which appear in some of the earliest war scenes indicate that horses were known not much later than the introduction of chariots and bullock carts (Figs. 18, 21-22, 67).

The riders in these war scenes are armed with spears and in rare cases with axes. Although swords are depicted in some of these war scenes, they are carried only by foot-soldiers, with one exception, where a warrior standing on the back of an elephant is shown armed with a sword (Fig. 79). It is in the Historic period only that swords are shown as regular weapons of horse riders.

Although representations of early horse riders are not very detailed, it is still quite clear that the animals were ridden without a saddle or stirrups. The reins are invariably shown as leading from the riders' hands over the head of the animal towards the muzzle (Figs. 18, 21-22, 64-67). The author's interpretation is that early horse riders controlled

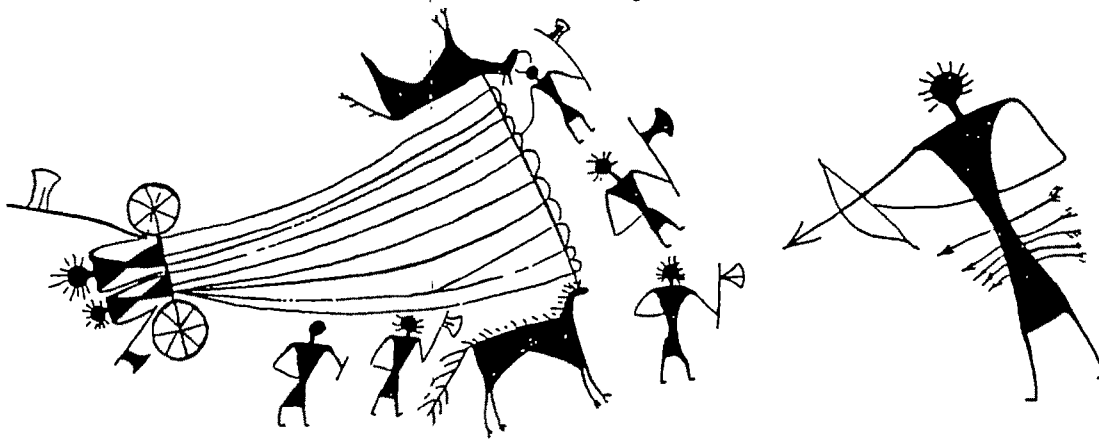


Fig. 27: Chibbar Nulla; Painting in red; Height of the bow-man 15 cm

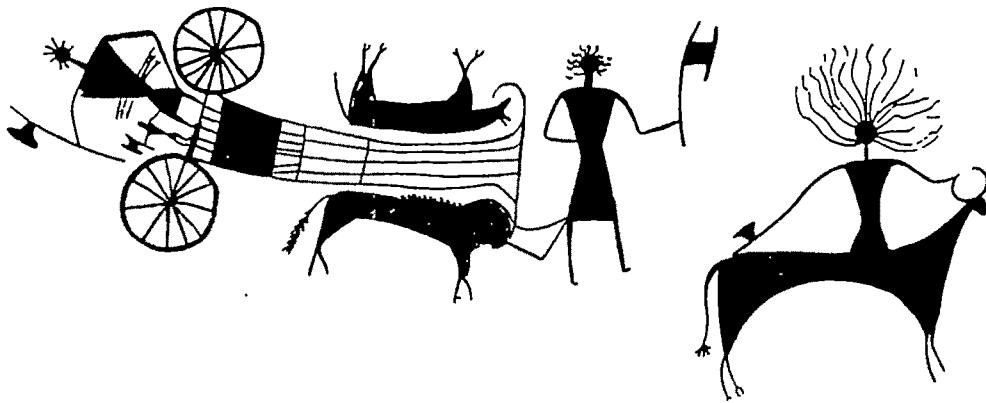


Fig. 28: Adarshila; Painting in red; Length of the ridden animal 20 cm

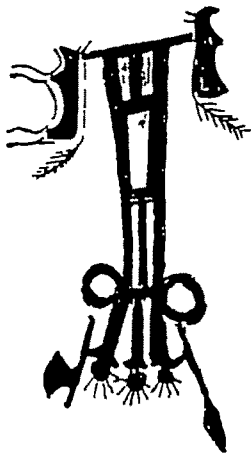


Fig. 29: Chatur Bhoj Nath Nulla; Painting in red and black; Length of the animals 10 cm

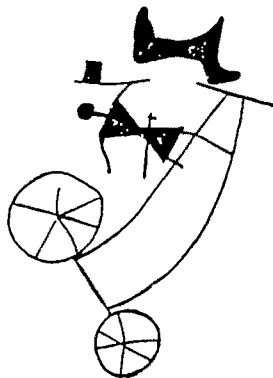


Fig. 30: Chibbar Nulla; Painting in red; Height of the man 7 cm

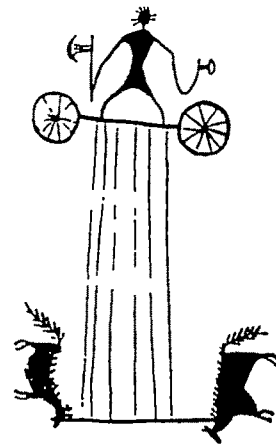


Fig. 31: Chibbar Nulla; Painting in red; Length of the draught animals 5 cm

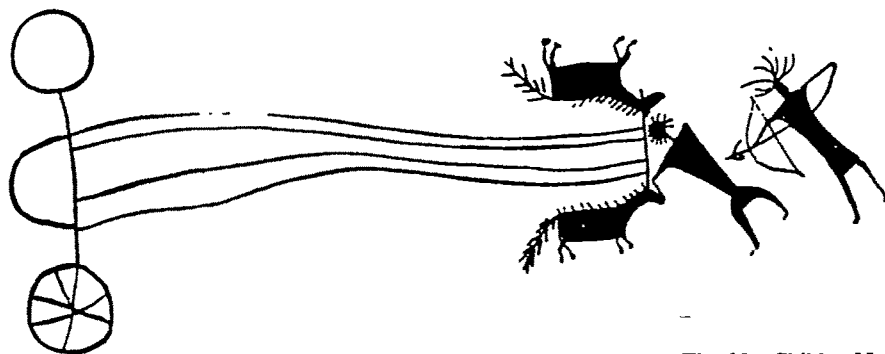


Fig. 32: Chibbar Nulla; Painting in red;
Height of the bow-man 7 cm

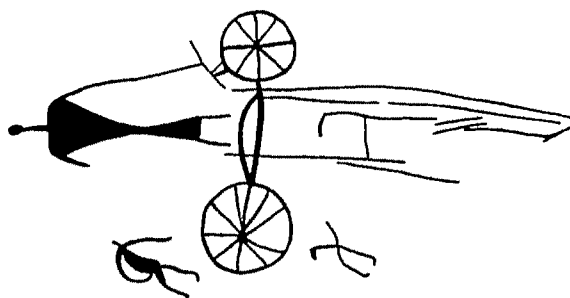


Fig. 33: Matschi Kalla; Painting in red;
Height of the charioteer 35 cm

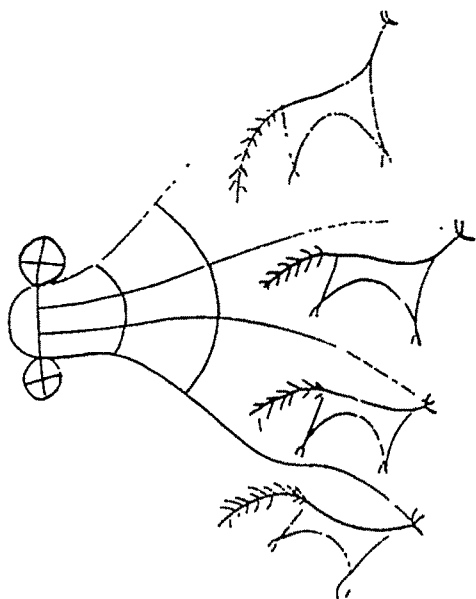


Fig. 34: Kanjadei; Painting in red;
Length of the draught animals 8 cm

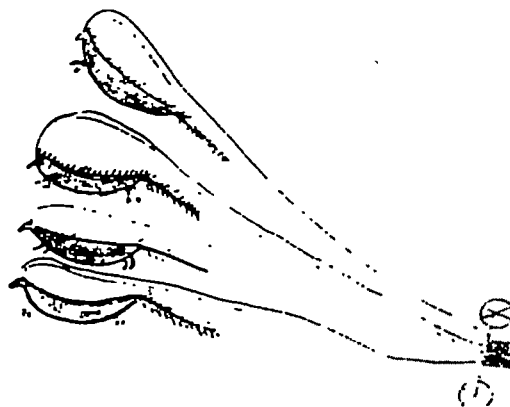


Fig. 35: Kanjadei; Painting in red;
Length of the draught animals 8 cm

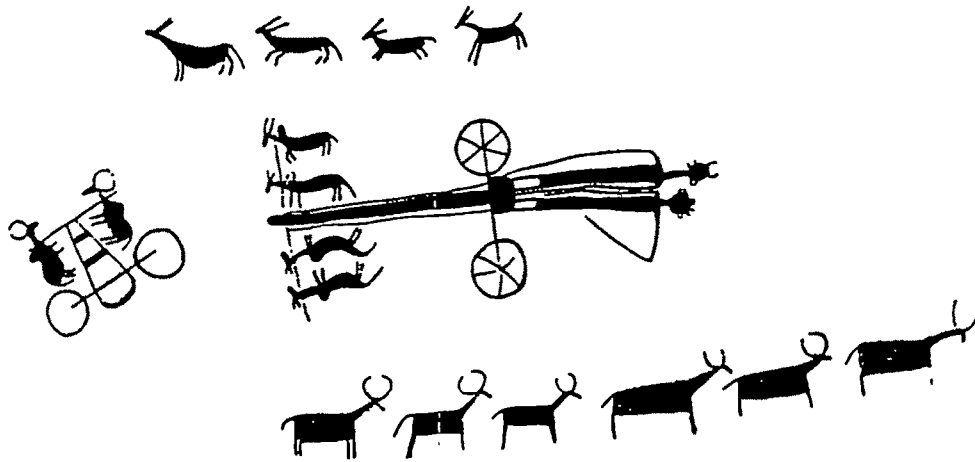


Fig. 36: Pahargarh-Asan River; Painting in red; Length of the draught animals 5 cm

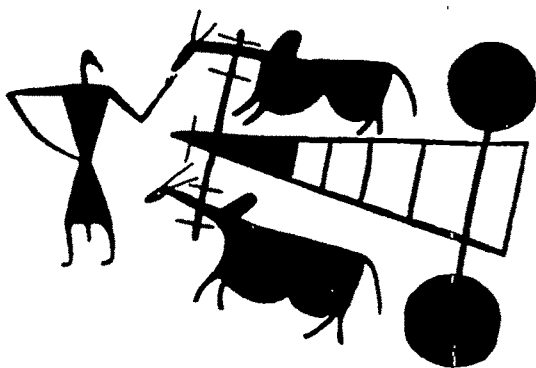


Fig. 37: Pahargarh-Asan River ; Painting in red; Height of the person 10 cm

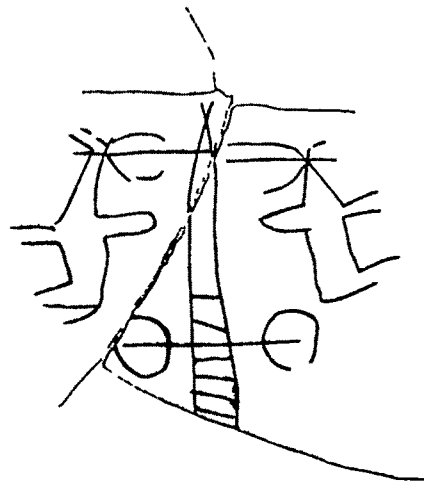


Fig. 38: Inamgaon; Engraving on a jar; Height 12 cm (approx.)

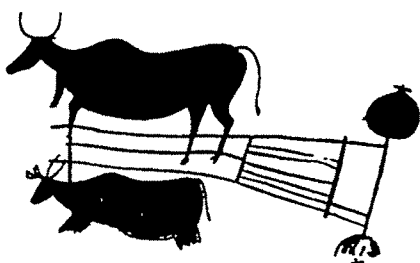


Fig. 39: Mahadeo Hills-Jalawatrun; Painting in white; Length of the upper animal 18 cm

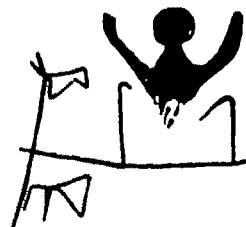


Fig. 40: Bhagawan; Painting in red; Length of the vehicle 18 cm

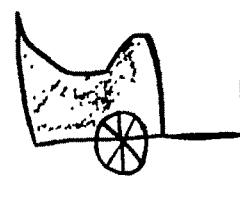


Fig. 41: Bhagawan; Painting in red and yellow; Length of the vehicle 15 cm

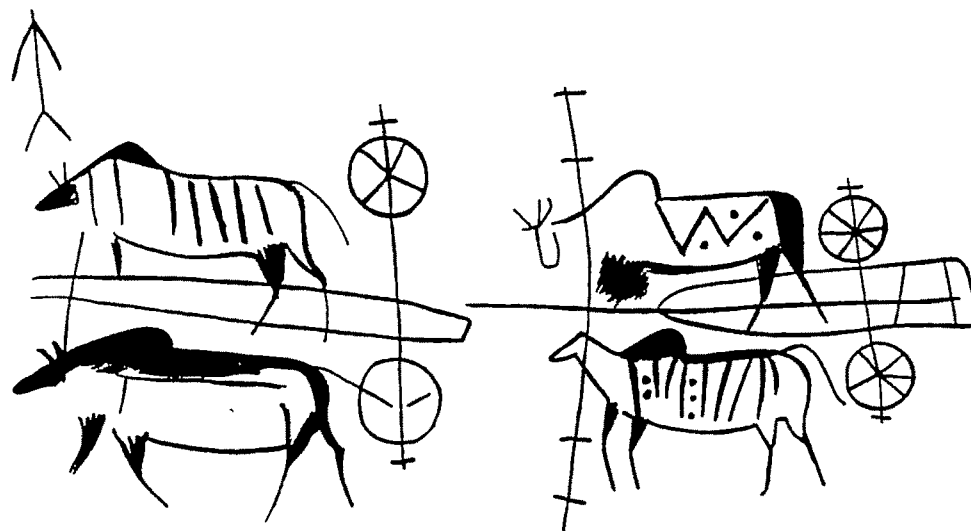


Fig. 42: Urden; Painting in white and red; Length of the right vehicle 17 cm

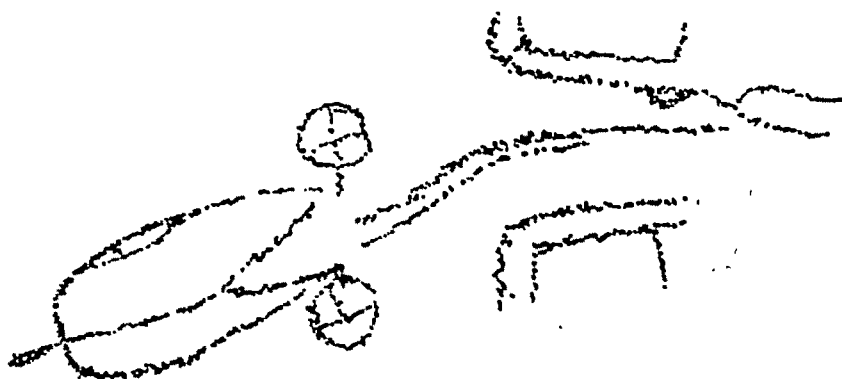


Fig. 43: Maski; Bruising; Length of the picture 35 cm



Fig. 44: Edakal Cave;
Engraving; Length 110 cm

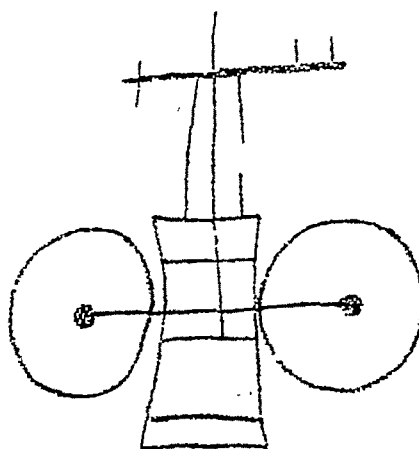


Fig. 45: Kappagallu; Bruising;
Length 45 cm

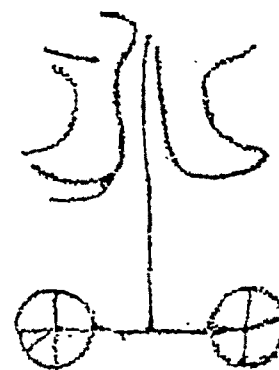


Fig. 46: Badami-Hiregudda; Engraving;
Length 30 cm.

their mounts not with the help of a bit, but rather by a piece of wood or rope threaded through the nostrils of the animals, very much like the lead control of draught animals yoked to carts.

Saddles appear for the first time only in the historic period, but even then stirrups are never depicted (Neumayer 1983: 143-144).

The horses shown yoked and ridden in the early rock paintings seem to be rather small sturdy animals with stubby manes often indicated not only at the neck, but extending far over the shoulder and all along the withers and also at the throat (Figs. 21, 24, 31-32, 64-67).

The horse's tail is invariably drawn as a single straight line from which the strands of hair project rather like a palm-leaf (Figs. 2-6, 11, 21-22, 24-25, 27-29, 31-32, 65-67).

These features might not be more than a stylistic convention, though they might point to certain peculiarities of the physical features of early horses, which might still have affinities with their Central Asian ancestors.

Pictures of horse riding are rare in the strict "pre-historic" context of rock art in Central India. In the Historic period scenes of horse riding become the central theme of rock art.

In south India the chronological position of depictions of horse riding is not very clear, partly because there are fewer paintings available compared to the vast number found in Central India, nor are rock paintings generally painted over time and again, which would make it easier to construct a relative stylistic chronology.

Most of the rock art in the southern Deccan consists of rock bruising, in which a succession of pictures can be recognized in rare cases only.

In the earliest paintings of the cattle keepers of South India, riding on bovines is shown quite frequently, and here as well the cult aspect of these pictures is rather obvious. Riding on horses is not shown in these earliest pictures whose theme centres mainly around cattle.

Horse riders appear in a later stylistic group which is not very easy to distinguish from the earlier one on account of the fact that the main theme of these pictures is still the portrayal of cattle, which are now not executed so vividly and dynamically.

Scenes of horse riding are often shown as part of large compositions (Figs. 68-74). The armoury of the horse riders depicted in these scenes indicates a period of advanced metal technology. Spears and swords are frequently shown as weapons, while axes occur only rarely (Figs. 73-74).

The riders are often part of a scene along with herds of cattle (Figs. 68, 70-71) or with game animals like the stag and antelopes (Fig. 71). The dog is frequently shown accompanying the riders on these hunts.

Scenes of horse riders are frequently found at places in the vicinity of Megalithic burial sites. Some of the best preserved paintings of horse riders in the southern Deccan come from shelters close to the large Megalithic cementaries of Hire Benakal (Figs. 68, 71-74). In these scenes the horsemen are armed with spears, axes and girded swords.

Pictures of mounted animals also appear inside Megalithic graves in Tamil Nadu, particularly at sites in the surroundings of Krishnagiri in Dharmapuri District. Most of the animals found inside these graves are rather fabulous beings though some of them could perhaps be identified as horses. Although it is not clear whether these pictures were painted at the time of construction of the tombs or only after their destruction, they fit well into the whole complex of south Indian burial and memorial customs, of which at least some of the rock paintings seem to have been a part (Neumayer 1988b: Fig. 83).

Armed riders mounted on horses, carrying swords and axes were also found frequently at sites in the South Arcot district of Tamil Nadu (Figs. 77-78) as well as in shelters in the environs of Madurai (Figs. 75-76). Often these particular horse riders are led by a second person armed with an axe.

These themes remind one of carvings from hero stones and of wooden memorial boards which are still carved and set up by several groups of people after the death of a person.

Representations of horsemen become a central theme only in rock pictures of the Historic period so much so that mounted warriors are probably the single most frequently depicted figures of the rock art of the period (Neumayer 1983: 142-145).

Riders on elephants are extremely rare in prehistoric pictures. Since most of these elephant figures are isolated depictions, their stylistic affiliation is not always clear.

Two outstanding and early examples of elephant riders come from Firengi (Figs. 79-80). In one picture a man is seen standing on the back of an elephant, controlling the animal as one would cattle or horses with reins. The rider is carrying a girdled sword or large dagger of the same kind which already appeared in an earlier mentioned fighting scene in which a chariot is seen (Fig. 81).

In the other painting from the same site (Fig. 80) two figures are seen riding on an elephant. One of them is armed with an axe and is also holding the reins, while the other is probably armed with a bow. On account of the weapons depicted here these paintings can probably be taken as rather late examples of prehistoric art in this region.

Depictions of warriors on elephant-back are also known from the bruising in the Kappagallu Hill (Figs. 81-82).

Elephant riders are seen more frequently in the rock art of the Historic period, although their overall number is



Fig. 47: Yerdanur; Painting in red; Average length of the cattle 30 cm

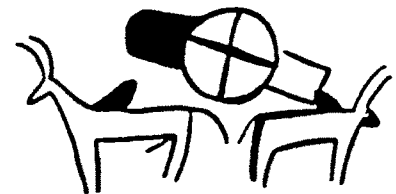


Fig. 48: Yerdanur; Detail from Fig. 47

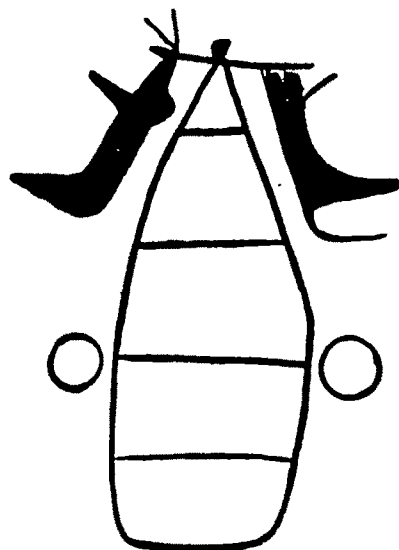


Fig. 49: Benakal Forest-Rampura; Painting in red; Length of the cart 50 cm

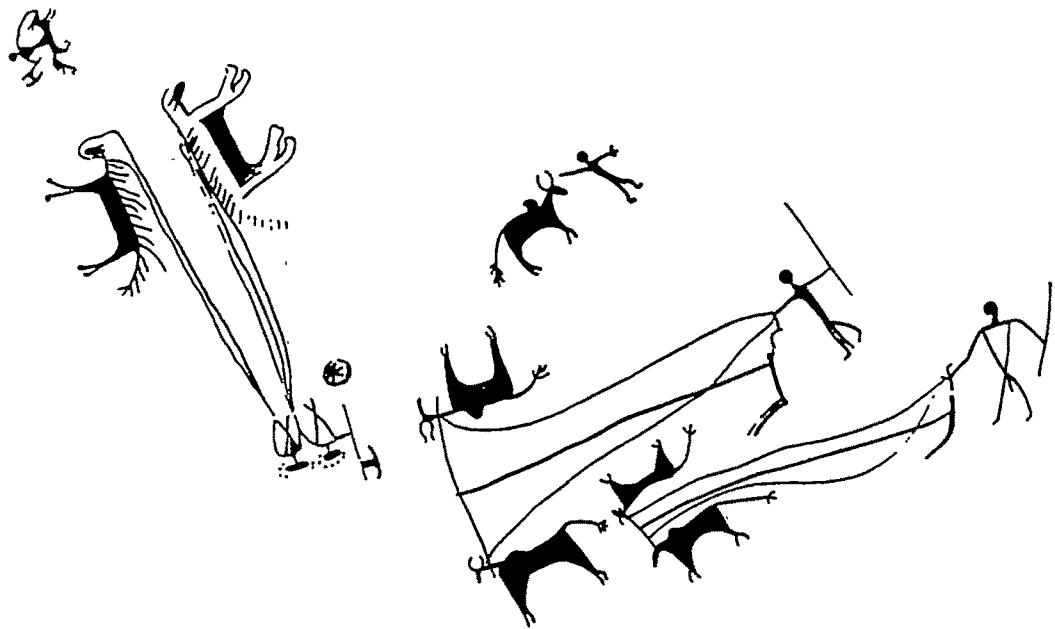


Fig. 50: Chatur Bhoj Nath Nulla; Painting in red; Average length of the animals 10 cm

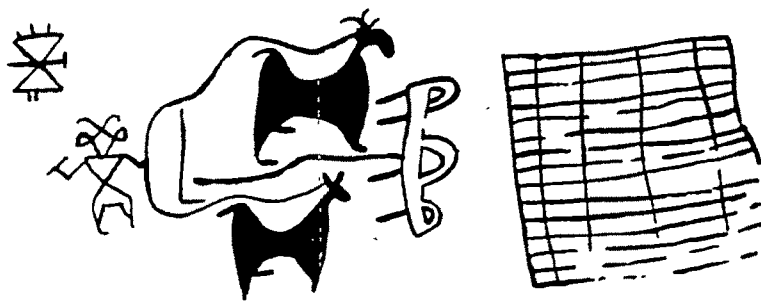


Fig. 51: Lakhajour; Painting in white; Length of the cattle 20 cm

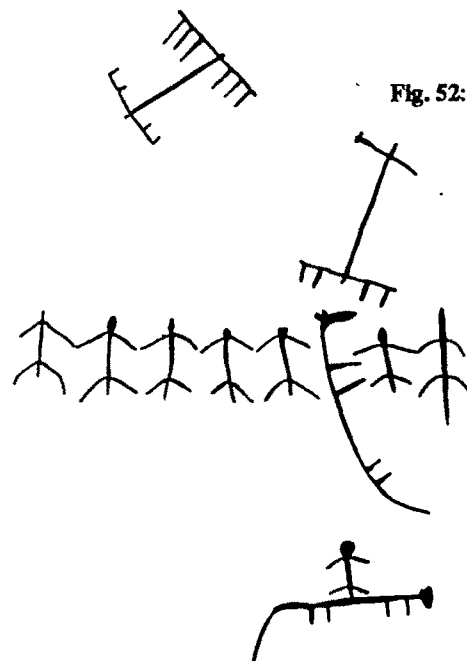


Fig. 52: Mosaillana Guddu; Painting in white;
Length of lower animal 30 cm



Fig. 53: Patsal; Painting in white;
Length of the lower figure 14 cm

Fig. 54: Firengi; Painting in red;
Height of the rider 19 cm

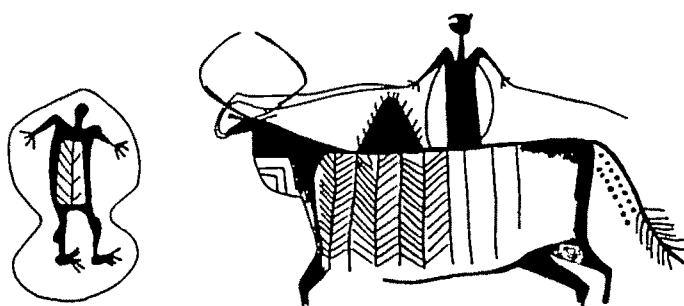


Fig. 55: Firengi; Painting in red;
Length of the bovid 26 cm

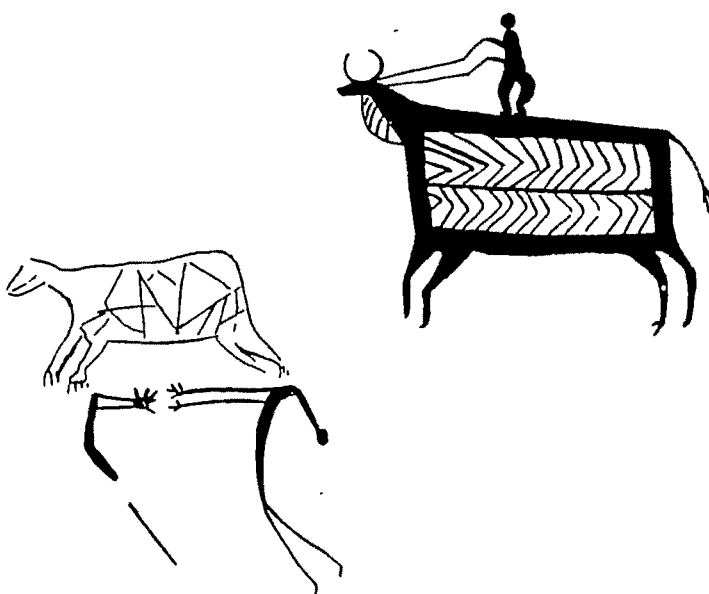


Fig. 56: Makoriya; Painting in red;
Height of the rider 15 cm

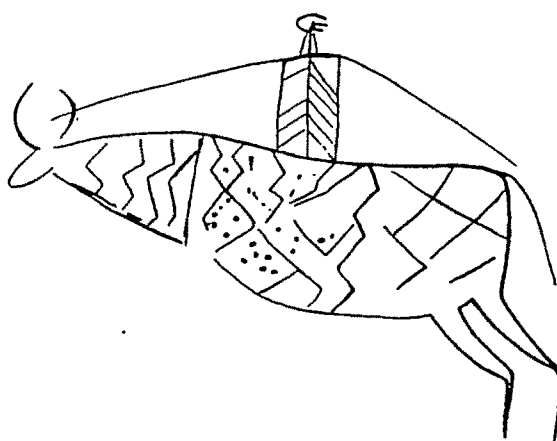


Fig. 57: Chatur Bhoj Nath Nulla;
Painting in red; Length of the animals 7 cm



rather low. In rock art pictures of the Historic period the Elephant riders are seen more frequently although their overall number is rather low. Warriors on elephants are shown in the rock pictures of this period often with the insignia or paraphernalia of an elevated social status, for example, umbrellas which are held above them by adjudants (Neumayer 1983: 145). The elephants depicted in Prehistoric Pictures are not equipped with howdahs or seats as they are known from other historic sources.

Depictions of camels are absent in Prehistoric paintings. Camels are also extremely rarely depicted in historic rock art. One of the few camel riders appears in the scenes featuring an elephant headed god.

Another category of mounted animals are 'beings' of fabulous shapes and comparable to Makhrama figures as they are known from Sunga reliefs at early Buddhist sites in northern India.

Although these 'beings' appear only in the Historic rock paintings of the Mahadeo Hills, they should be mentioned here, as they may represent a continuation of the fabulous animals which already appear in the rock pictures of the prehistoric hunters and gatherers. Fantastic composite animals are also known from seals of the Chalcolithic period. Some of these creatures seen in the rock pictures look rather like snakes or fish with horse-heads and have coiled or long stretched bodies with or without legs (Figs. 83-85). The riders of these beings are frequently armed with daggers or axes.

Other mounted animals like tigers appear on and off at several rock art sites of the Early Historic period all over India. These rather exotic mounts and their riders most probably represent gods and goddesses already being recognized iconographically as associated with particular *vahanas*. This is quite clear in a picture from Bhimbetka showing Ganesha and his *vahana* the rat, mounted under a baldachin on the back of a horse in a procession scene.

Discussion

The chronological position of the chariot as represented in the rock paintings of Central India is rather puzzling. It appears immediately in the first stylistic groups in which indications of animal domestication exist. Stylistically there is a clear demarcation between these paintings and the earlier ones of the hunter-gatherers in which there are no indications of animal domestication or of the use of metal weapons.

Although composite microlithic tools like barbed arrows and spears continue to be shown, there is a progressive trend towards leaf-shaped and tanged types, which the author interprets as metal arrow- and spear-heads.

The change from the lifestyle of the hunters and gatherers to that of a food-producers is not shown as a

gradual process of change with nuances, but appears suddenly as a totally new pictorial world view.

Although hunting depictions are not rare in the early pictures of the agriculturists and animal keepers, the prominent thematic centre of these pictures is cattle. This is also the case in South India, where thousands of rock paintings and paintings of this period hardly depict anything else besides figures of bovines.

It is known from finds of miniature clay models that carts were used in the urban settlements of the Harappan culture region, but the constructional features of most of these cart frames are basically different from the carts depicted in rock pictures. While the miniature cart frames found in Harappan settlements are square and are connected by a central pole to the yoke, the carts in the rock pictures consist of a triangular frame which rests directly on the yoke. Only one cart depicted at Kappagallu has comparable constructional features with those of the Harappan carts (Fig. 45). On the other hand the depiction of a bullock cart incised into a large storage vessel found at Inamgaon shows similar constructional features with those found in rock pictures (Fig. 38). This engraving belongs to the Chalcolithic Jorwe phase of that site (Allchin, B. and F.R. Allchin 1982: 282, Fig. 10.17).

The technical details of the chariots depicted in rock pictures are comparable to many of the features of the model copper chariot found at Daimabad, except for the fact that the latter is drawn by bulls, while most of the chariots found in rock art are drawn by equids.

We do not know if the people who painted the pictures of chariots also used them, or whether the art only reflected innovations of an alien culture with which they had relations of a symbiotic or antagonistic nature. The clumsy portrayal of the horses and the often incorrect rendering of the features of chariots rather point to the second possibility. On the other hand, chariots are integrated in narrative cultic (?) procession scenes.

However, it is possible that these depictions document contacts between the autochthonous population and a technically advanced population segment which might have linked the Chalcolithic urban centres to their vast economic hinterland, bringing with them not only a gradual change in economy and technology but also the seeds of social turmoil which were to change the ethnic tribal fabric.

The arms shown along with chariots express to some extent a dichotomy of weapons. While the chariot crews and their auxiliary troops are often equipped with metal weapons, most important of which are the large battle axes, the antagonistic foot-soldiers are more often equipped with bows and arrows. In later stylistic groups, swords and shields make their appearance and again these are used by elephant riders and horsemen and troops riding in chariots.

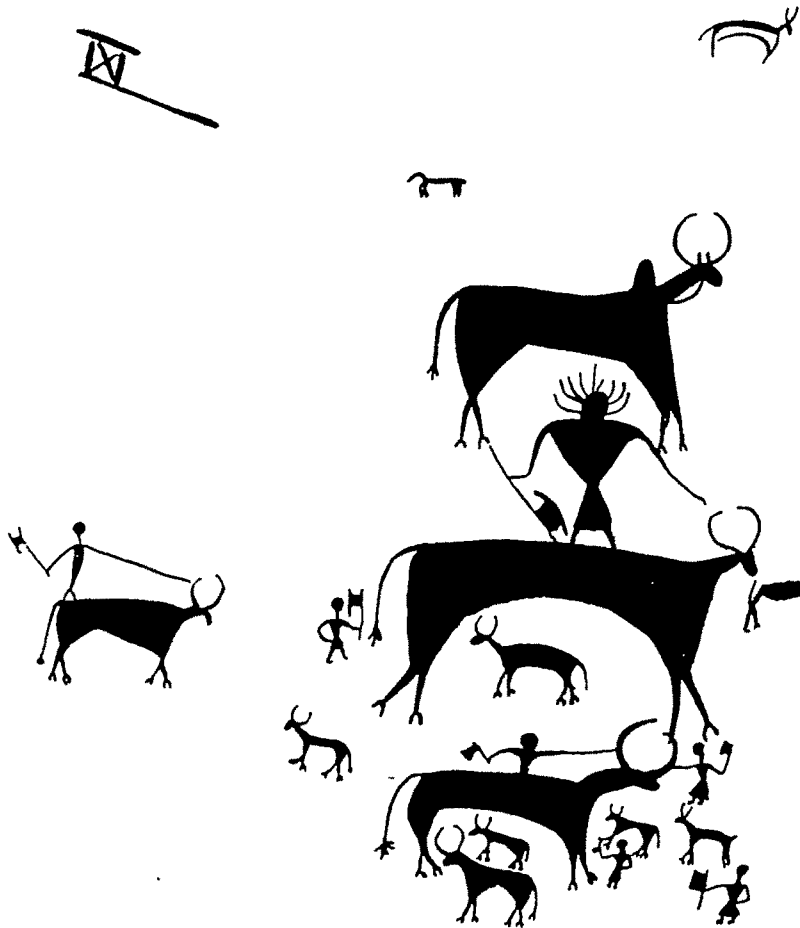


Fig. 58: Adarshila; Painting in red; Length of the larger bovid 20 cm

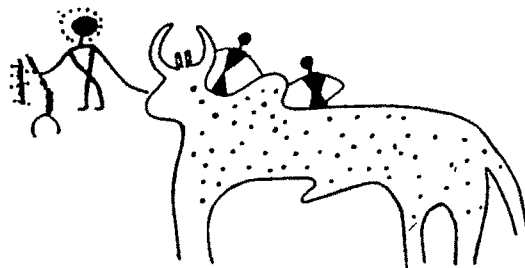


Fig. 59: Chatur Bhoj Nath Nulla; Painting in red and white; Length of the bovid 15 cm

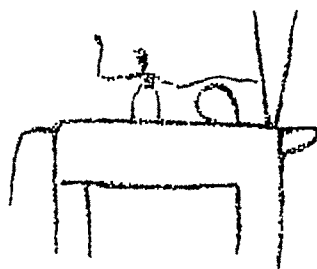


Fig. 60: Maski; Bruising;
Length of the bovid 50 cm

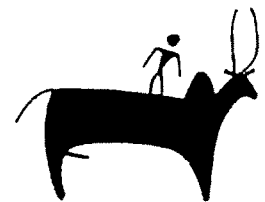


Fig. 61: Kappagallu; Bruising;
Length 42 cm



Fig. 62: Maski; Bruising;
Length of the bovid 40 cm

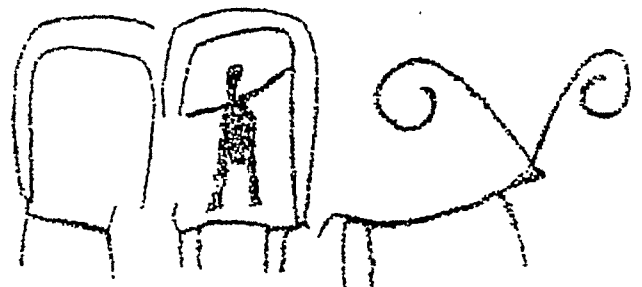


Fig. 63: Kaltse; Engraving; Length of the right animal 35 cm



Fig. 64: Firengi; Painting in red;
Length 12 cm

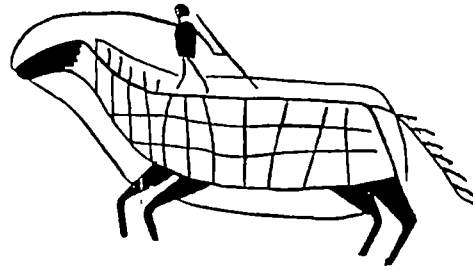


Fig. 66: Jaora; Painting in red;
Length 20 cm

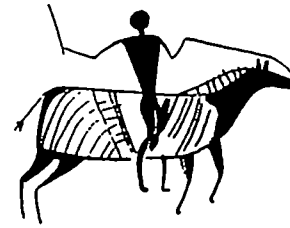


Fig. 65: Urden; Painting in red;
Length 12 cm



Fig. 67: Firengi; Painting in red; Average length of the horses 10 cm



Fig. 68: Hire Benakal; Painting in red; Length of the bovides 15 cm

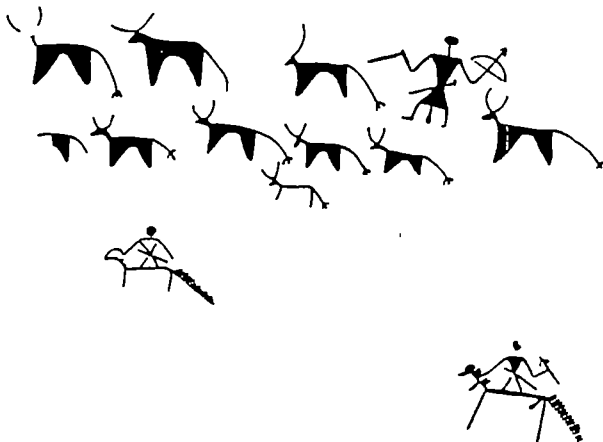


Fig. 70: Beniakal Forest-Rampura; Painting in red;
Hight of the left bow-man 20 cm

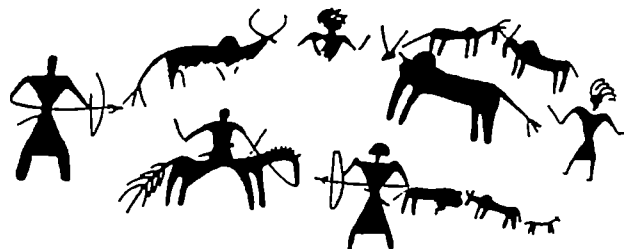
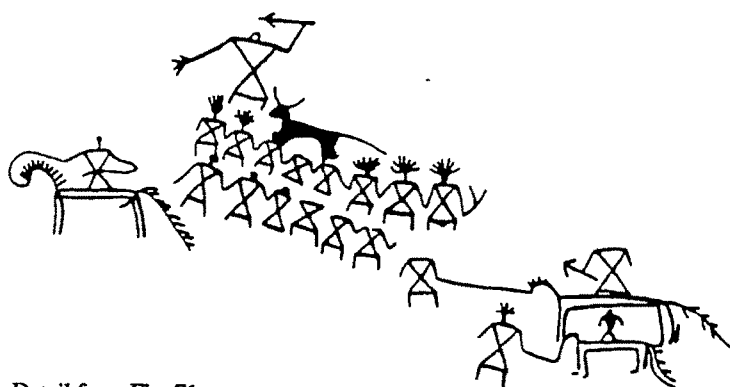


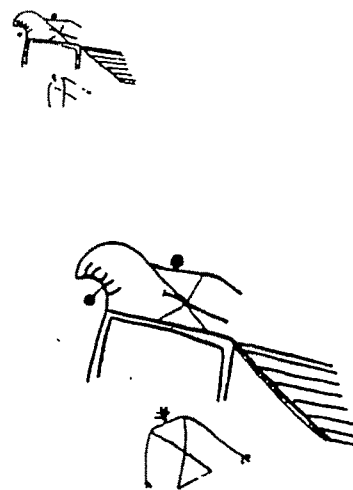
Fig. 69: Piklihal; Painting in red; Hight of the right figure 15 cm



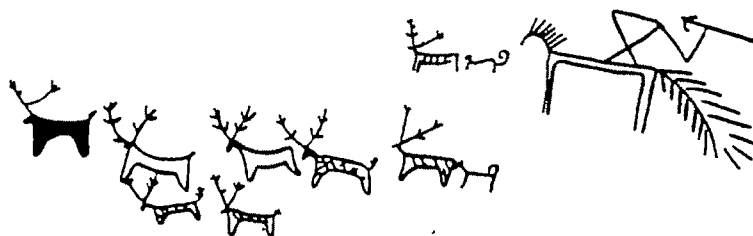
Fig. 71: Hire Benakal; Painting in red; Length of the upper right bovid 36 cm



Detail from Fig. 71



Detail from Fig. 71



Detail from Fig. 71

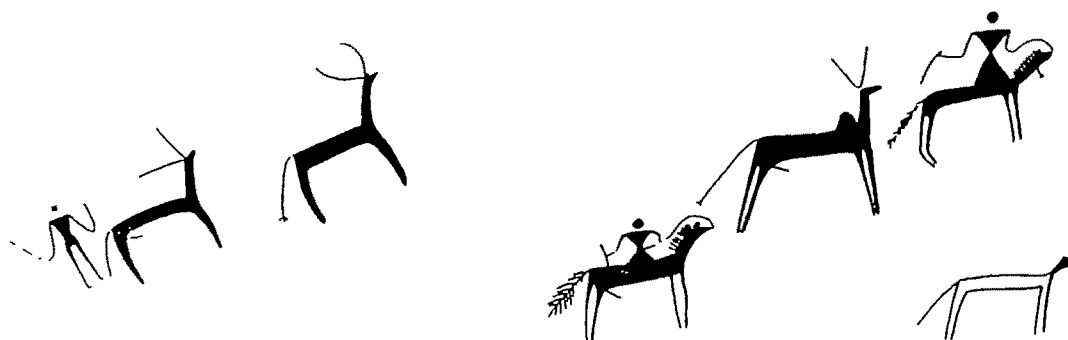


Fig. 72: Hire Benakal; Painting in red; Height of the right horse and rider 25 cm

It would be rather stretching the evidence to explain these pictures as a documentation of the struggle of an autochthonous population armed only with bows and arrows against nomadic cattle keepers armed with axes, spears and at times with swords and shields (Kosambi 1962: 26). Prehistoric evidences rarely come in these clear cut categories. Still the scenes represented in the rock paintings would fit well with such a scenario and also with the archaeological evidences as far as we can interpret the relationship between the Chalcolithic societies at the periphery of the late Harappan culture area and the hunting-and-gathering populations which were drawn more and more into the economic spheres of trade, agriculture and the exploitation of natural resources.

Chariots become progressively less evident in the latest Prehistoric pictures and are virtually absent in Historic rock paintings. The few Historic depictions of wheeled vehicles are found in the region around Bhopal and in the Mahadeo Hills (Figs. 39-42). This of course does not conform to literary evidence from the early Historic period, from which we know that chariot troops comprised one of the four divisions of an army.

Kautilya's Arthashastra mentions different types of chariots (Sharma Sastry 1967: 159) and also dwells minutely on the strategic employment of chariots during warfare. Chariots are also depicted frequently in the early Historic reliefs of Sanchi and many other early Buddhist sites in North and Central India. An interesting portrayal of a miniature quadriga, belonging to the second century A.D., which was used as a chess piece, was found in Sri Lanka (Van Lohuizen de Leeuw 1982: 245-249). From the Mauryan palisades of Pataliputra comes a spoked chariot wheel which was found there *in situ* during excavations (ASI 1935-36: 54-55; Gupta 1980: Pl. 106 a, b).

Horse riders appear in rock pictures simultaneously or, at the most, not much later than the depiction of horse-drawn chariots. But in none of the prehistoric pictures are horses depicted otherwise than ridden or yoked to chariots. Never are they seen as being herded in the way cattle are so frequently shown in the rock art of that period. This is a strong indication that indeed horses are portrayed by people not very well acquainted with them.

If these pictures portray only encounters between an autochthonous hunting-and-gathering population and intruders equipped with horses and chariots, we are left with the problem as to why the same autochthonous population should not have reflected upon the agricultural population which at least since the Mature Harappan period, had established a great number of village settlements in the general region from which the rock pictures are known.

If on the other hand the autochthonous population did reflect on these farming communities and portrayed the life style of these early farmers, we are left with the notion that

these early farming communities already possessed horse-drawn chariots and perhaps knew how to ride — a hypothesis which goes against archaeological data known so far from Central India. It is more likely that the early farmers and cattle keepers were the authors of the paintings. This incidentally would also solve the problem of the stylistic differences between the paintings of the earlier groups showing the life-ways of hunter-gatherers only, and these pictures which already show domesticated cattle and other domesticated animals. In the course of time these incipient farming communities would have come into contact with people equipped with chariots, heavy copper weapons and, what would appear to be the crucial point of the chronological problem, the horse.

All that rock pictures tell us about the introduction of horses is that they were introduced primarily as draught animals for chariots and slightly later used as mounts.

The rock pictures show clearly that the highly developed metal technology which formed the basis for the production of chariots was introduced into regions in which microlithic tools were still used by people already practicing agriculture and keeping humped cattle.

The chariots and bullock carts were most probably not used by this autochthonous population, which accounts for the scarcity in the rock art of chariot depictions, as also for the incorrect rendering of the physical features of the horses and for the incorrect depiction of the technical details of chariots.

The wheeled vehicles were most probably portrayed as an exotic product of an alien population, which besides possessing chariots also had heavy metal axes, whose shape is reminiscent of copper axes known from the hoards from Northern and Central India.

Any further interpretation of the pictorial evidences would reduce them to illustrations of pre-conceived ideas which are based on literary evidences, above all the invasion of the Rig-Vedic Aryans, which is invariably brought up as soon as horse-drawn chariots are only so much as mentioned.

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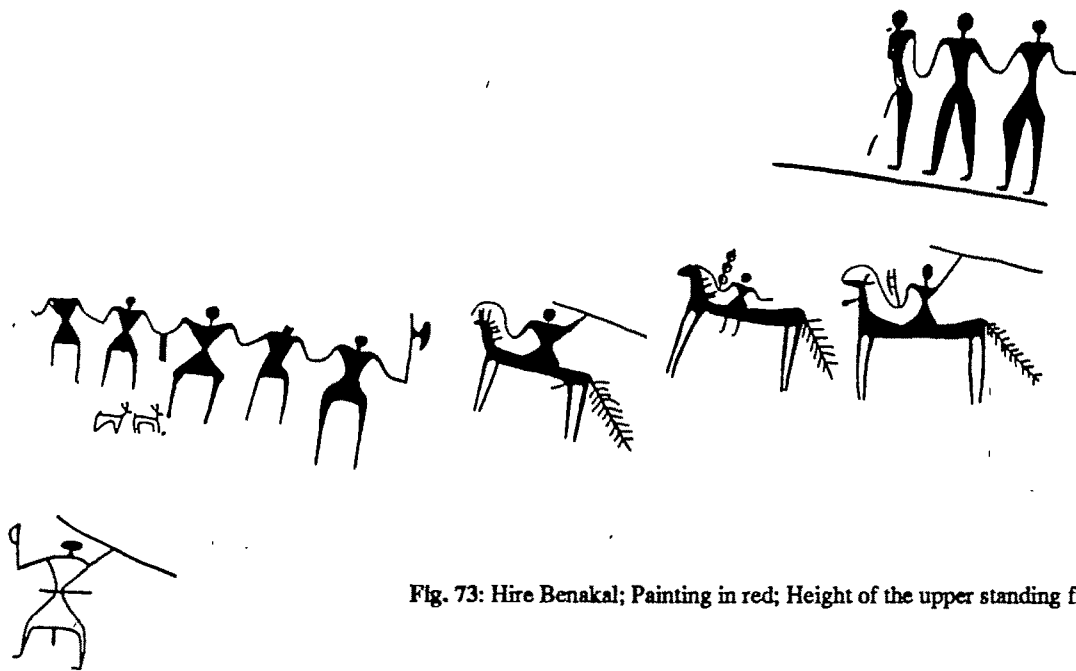


Fig. 73: Hire Benakal; Painting in red; Height of the upper standing figures 26 cm

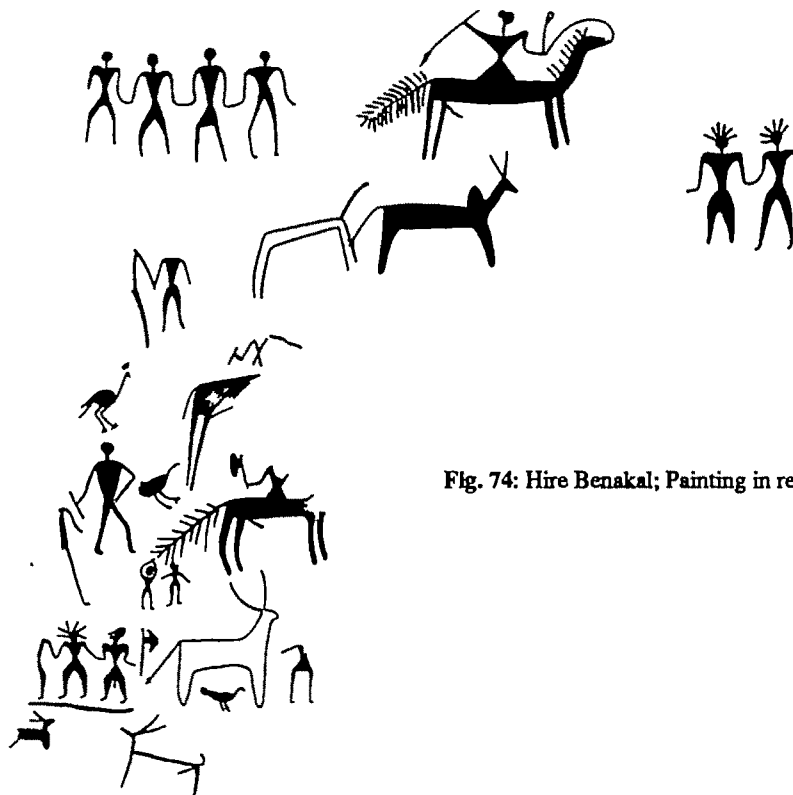


Fig. 74: Hire Benakal; Painting in red; Height of the right standing figures 20 cm

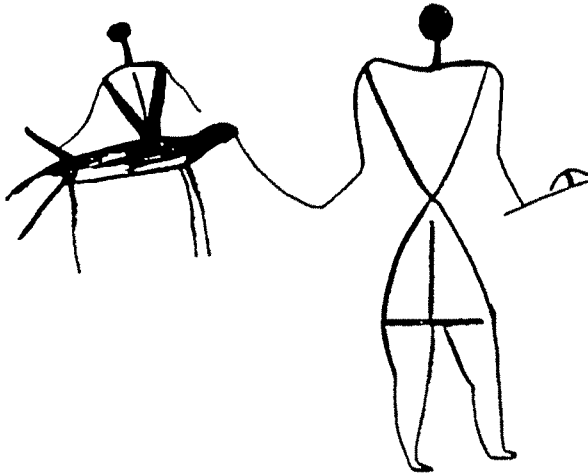


Fig. 75: Madurai-Alagar Kovil-Sundarajanpatti;
Painting in red; Height of the right man 30 cm.



Fig. 76: Madurai-Alagar Kovil-Sundarajanpatti;
Painting in red; Height of the left man 40 cm

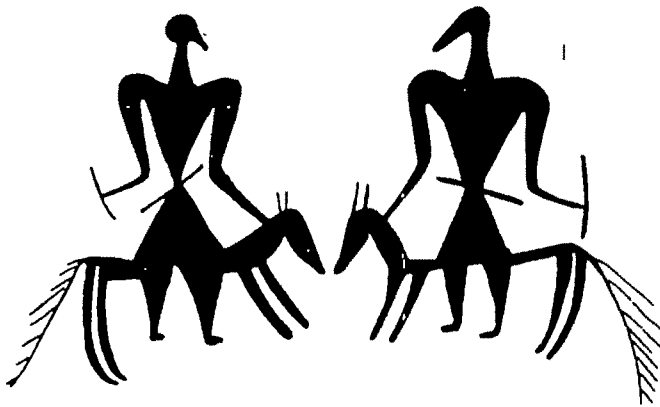


Fig. 77: Kilvalay; Painting in red; Height of the figures 25 cm

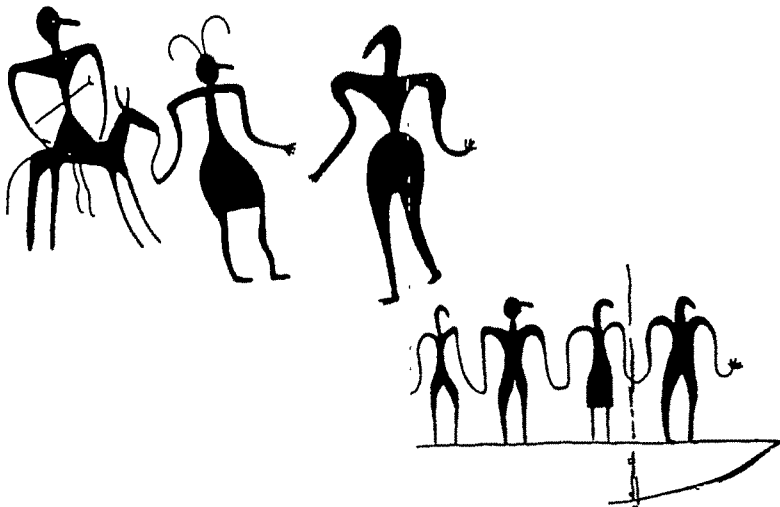


Fig. 78: Kilvalay; Painting in red; Height of the right figures 15 cm

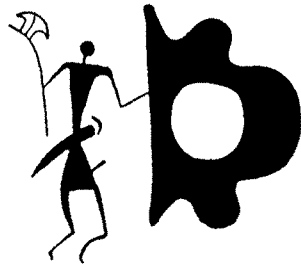


Fig. 79: Firengi; Painting in red;
Height of the upper standing man 16 cm



Fig. 80: Firengi; Painting in red;
Height of the ax-man 9 cm

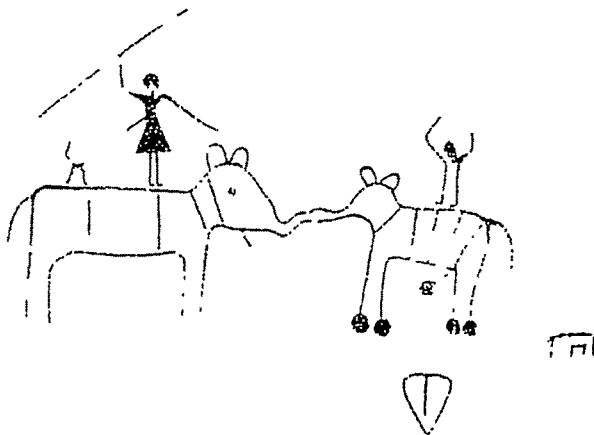


Fig. 81: Kappagallu; Bruising;
Length of the left elephant 90 cm

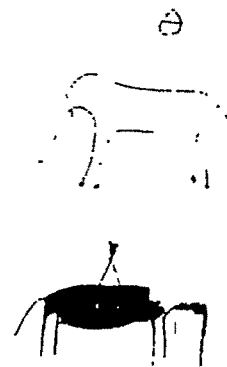


Fig. 82: Kappagallu; Bruising;
Length of the lower elephant 60 cm

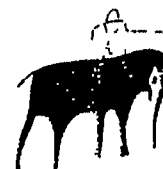




Fig. 83: Mahadeo Hills-Agamdwar; Painting in white; Length of the animal 60 cm

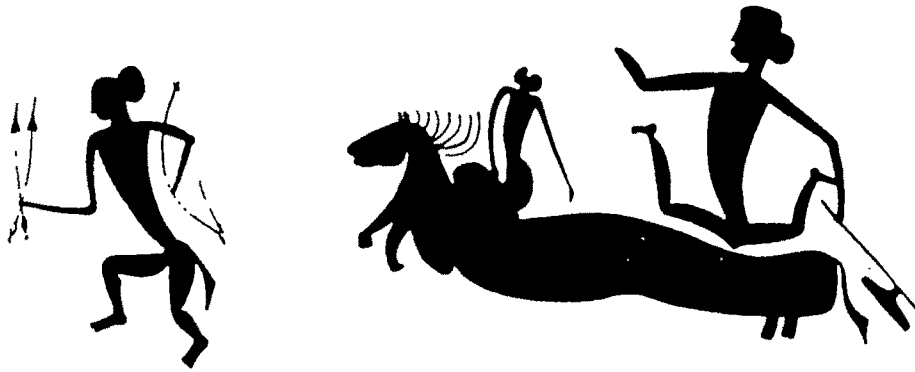


Fig. 84: Mahadeo Hills-Agamdwar; Painting in white; Length of the animal 50 cm

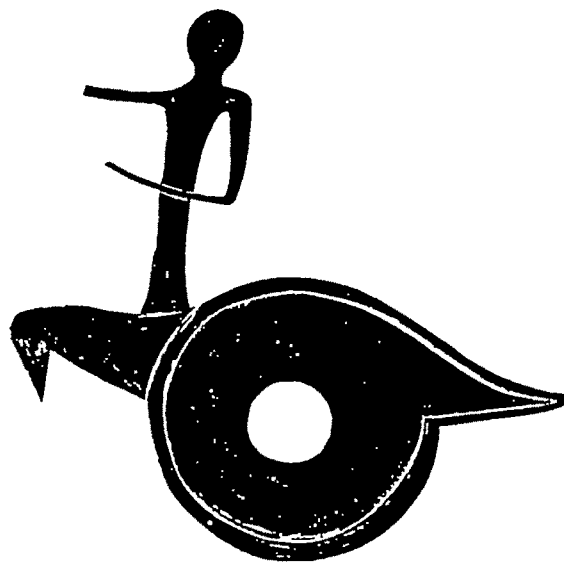


Fig. 85: Mahadeo Hills-Dorothy Dweep; Painting in white and red; Height 25 cm

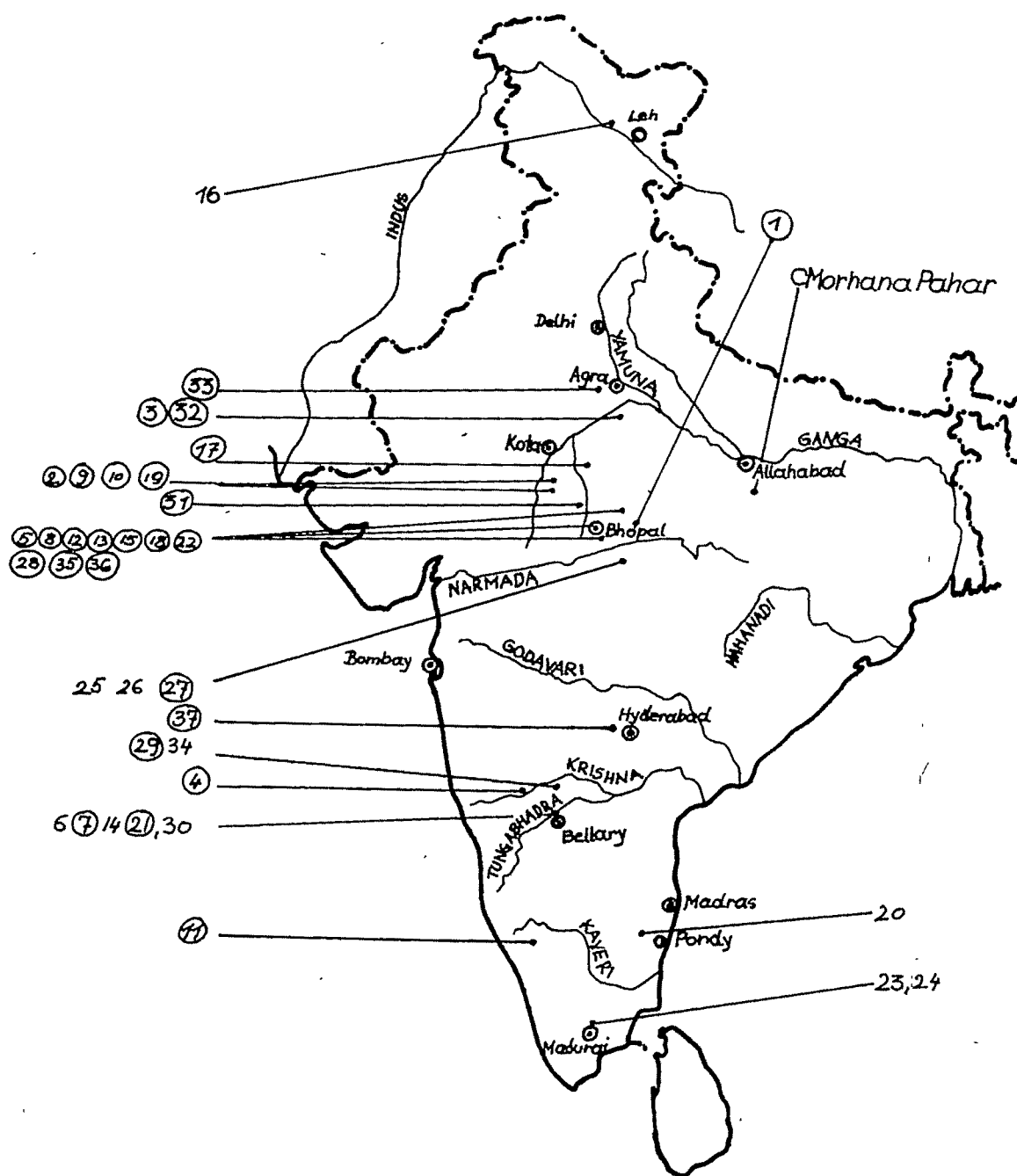


Fig. 86:

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Index to Sites (Figs. 86-87)

Sites	District	State
Abchand	Sagar	Madhya Pradesh
Adarshila	Mandasor	Madhya Pradesh
Asan river valley	Moreny	Madhya Pradesh
Badami-Hiregudda	Bijapur	Karnataka
Bangawan	Raisen	Madhya Pradesh
Benakal Forest	Raichur	Karnataka
Benakal Forest Rampura	Raichur	Karnataka
Bhopal-Dharampuri	Raisen	Madhya Pradesh
Chatur Bhoj Nath nulla	Mandasor	Madhya Pradesh
Chibbar nulla	Mandasor	Madhya Pradesh
Edakal Cave	Khozikode	Kerala
Firengi	Bhopal	Madhya Pradesh
Gelpur	Raisen	Madhya Pradesh
Hire Benakal	Raichur	Karnataka
Jaora	Raisen	Madhya Pradesh
Kaltse	Ladakh	Jammu & Kashmir
Kanjadei	Kota	Rajasthan
Kathotia	Sehore	Madhya Pradesh
Katiria Kund	Mandasor	Madhya Pradesh
Kilavalay	South Arcot	Tamil Nadu
Kappagallu	Bellary	Karnataka
Lakhajor	Raisen	Madhya Pradesh
Madurai-Alangar	Madurai	Tamil Nadu
Covil-Sundarajampatti		
Mahadeo Hills-Agamdar	Hoshangabad	Madhya Pradesh
Mahadeo Hills-Doroty Dweep	Hoshangabad	Madhya Pradesh
Mahadeo Hills-Jalawatrun	Hoshangabad	Madhya Pradesh
Makoriya	Raisen	Madhya Pradesh
Maski	Raichur	Karnataka
Moisaillana Guddu	Bellary	Karnataka
Narsingharh-Kotra	Rajgarh	Madhya Pradesh
Pahargarh	Morena	Madhya Pradesh
Patsal	Agra	Uttar Pradesh
Piklihal	Raichur	Karnataka
Putli Karad	Raisen	Madhya Pradesh
Raisen-Ramchaja	Raisen	Madhya Pradesh
Yerdanur	Sangareddy	Andhra Pradesh

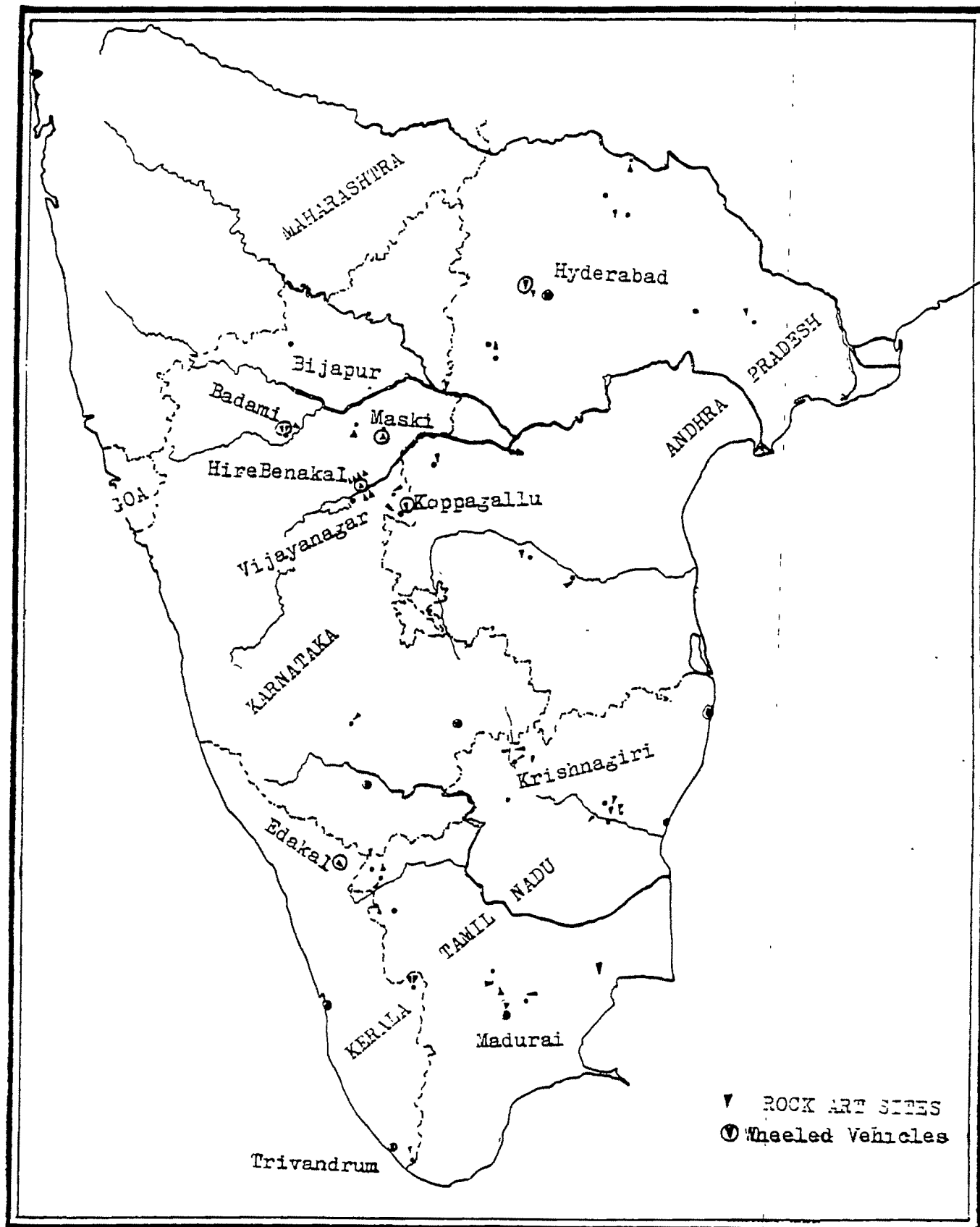


Fig. 87: Rock Art sites in the Southern Deccan

Rock Paintings of Budagavi, Anantapur District, Andhra Pradesh

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Abstract

This paper presents a stylistic analysis of the rock paintings of Budagavi, a Neolithic rock art site in Andhra Pradesh. This aspect has thus far been neglected in studies of South Indian rock art. The painted humped bulls at Budagavi would appear to be quite distinct from any of the other humped bulls in South Indian Neolithic rock art and represent an early phase of the Neolithic art of South India.

Introduction

Rock art research in South India, viewed in the Pan-Indian context, is in an embryonic stage. Neither intensive micro-level studies from a geological, geographical or ecological perspective, nor extensive macro-level studies comparing the data on rock art on an inter-site and intra-site scale from stylistic, thematic and chronological viewpoints, have been attempted (Chandramouli 1990). Thus far studies have remained static at, more or less, descriptive accounts of the rock art from individual rock shelters and sites. Even these studies do not pay much attention to the reconstruction of a relative chronological sequence and to understanding the peculiar and characteristic features of the rock art of a given site (Fawcett 1892; Gordon 1951; Gordon and Allchin 1955; Krishnamurthy 1977). More detailed studies dealing with larger geographical zones are not comprehensive (Allchin 1960; Allchin and Allchin 1963; Ganapayya Bhat 1981; Rami Reddy 1971; Sundara 1984).

To most Indian and even some foreign scholars (Neumayer 1978; Allchin and Allchin 1963) the rock art of South India is almost synonymous with the Neolithic art of painted, bruised and engraved naturalistic and schematic humped bulls of Maski, Piklihal, Tekkalakota and other sites in Karnataka. The rock art of Andhra Pradesh and Tamil Nadu is as yet little known. Though Mesolithic paintings have been identified in Karnataka, Tamil Nadu (Neumayer Pers. Comm.) and Andhra Pradesh they are not well known (Mathpal 1984: 22-23).

The two southwestern districts of Andhra Pradesh, Anantapur and Kurnool are in the granitic sandstone zone. In

this zone there are a few rock art sites containing paintings and bruising datable to the Neolithic period (Rami Reddy 1971). Among these sites, Budagavi is an important one. It shows painted humped bull figures stylistically distinct from other known painted or bruised bull figures in Andhra Pradesh and Karnataka. This micro-level study is an attempt to analyse the peculiar stylistic features of the humped bull paintings of this site and to compare them with similar paintings in Andhra Pradesh. The bruising of humped bulls in Karnataka and painted horned bulls from the central Indian rock shelters are also taken into consideration.

The Site

The village of Budagavi (Buddhagavi), in the Uravakonda taluka of Anantapur district, derives its name from the cave (Telugu: Gavi, Guha) in the hillock to the west of which the present-day village stands. Budagavi (14° 58'21"N; 77° 14'18"E) is located 6 km from Uravakonda 55 km north-west of Anantapur, the district headquarters on the highway to Bellary (Fig. 1). Budagavi is known for its historic remains on the top of the granitoid hillock (Fig. 2) locally known as 'Pedda Konda' (Telugu: Large hill), where several man-made terraces, brick stupas, tanks and other structural remains occur (Fig. 3). In addition to these microliths, ground and polished stone artefacts, pottery, rock paintings and bruising in and around the four rock shelters were also discovered.

The Rock Shelters

There are four rock shelters close to each other (on the top of the hillock) with paintings and bruising on their walls and

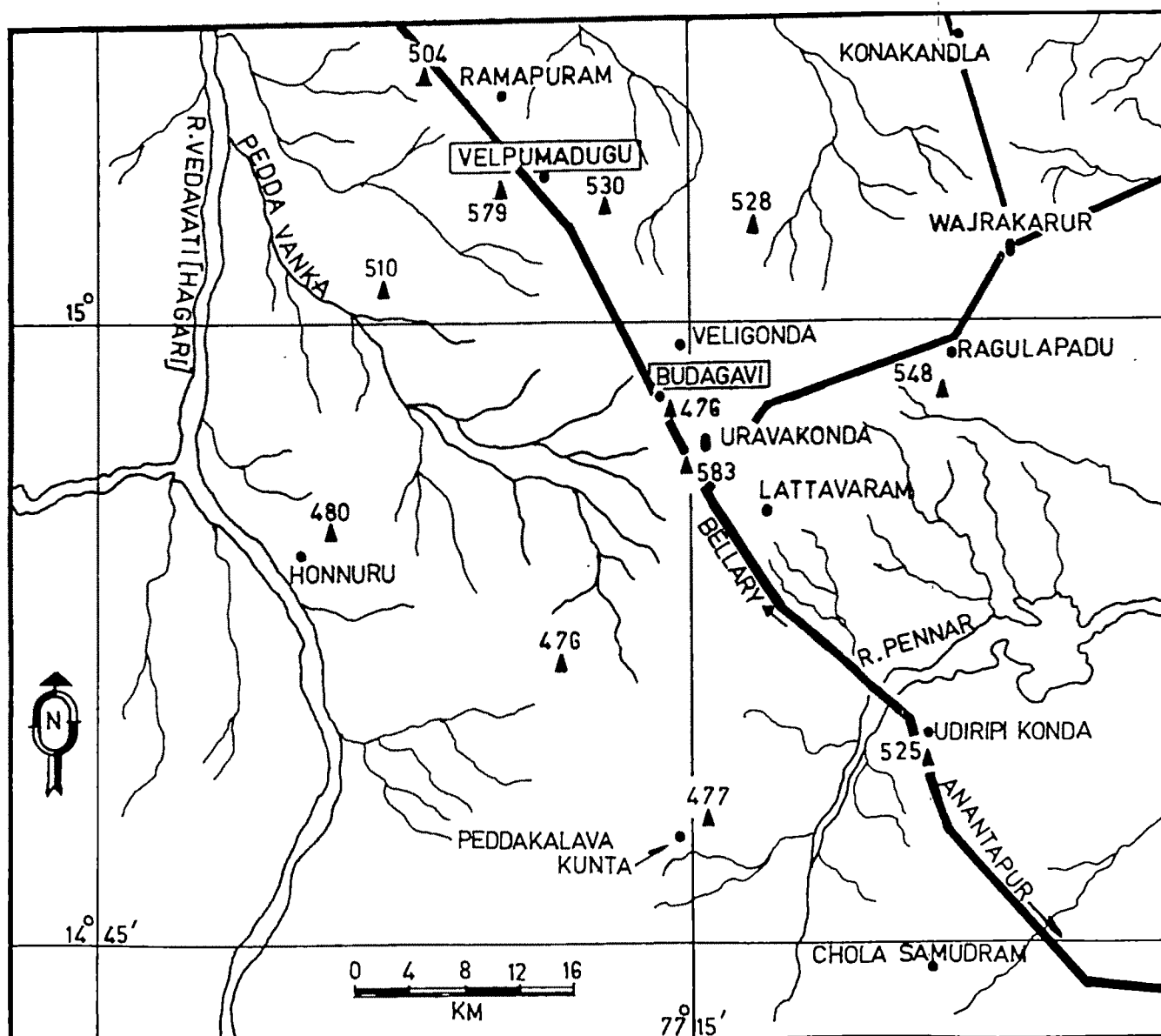


Fig. 1: Budagavi and its environs

ceilings. The paintings in Shelters 1, 3 and 4 are in red, while those in Rock Shelter 2 are in white.

Rock Shelter 1 is located to the right of the cave facing west. It measures 15 m x 20 m, and provides a shaded area of roughly 2 m all around it. Only two complete figures are visible from among the traces of several paintings. One of them is an incomplete figure of an animal which looks like a deer with its head turned backwards. It is done in flatwash and measures 9 cm x 8 cm (Fig. 4a) Another drawing is of a deer in outline. This rather schematic drawing measures 6 cm x 9 cm (Fig. 4b). These two figures are drawn in the centre of the wall of the rock shelter and 2 m above the floor level.

Rock Shelter 2 is located about 30 m to the left of Rock Shelter 1. It faces southeast and measures 10 m x 15 m. Though traces of extensive painting activity are visible, no

complete figures can be made out. There are two human figures in white, in thin outline. They appear to be walking and are superimposed on a faint unidentifiable figure in a red ochre flatwash. The human figure measures 11 cm x 10 cm (Fig. 5a). To the right of it is another human figure in flatwash measuring 15 cm x 18 cm. The legs and hands are shown outstretched (Fig. 5b). Both these figures are located towards the right corner of the rock shelter at a height of 2m from the floor level.

Rock Shelter 3 is located to the right of Rock Shelter 2 about 15m away facing east. It measures 15 m x 10 m. The front portion of this isolated boulder protrudes outwards to provide a shaded area of 2 m. The hollow portion of the rock contains paintings in red ochre. These are in a good state of preservation. They include 2 figures of deer, 6 humped bulls and a cow (?), hand prints and a schematic human figure.



Fig. 2: Budagavi atop granitoid hillock

Description of the Paintings

Fig. 6 a. An in-filled drawing of a deer in profile. The hind portion is incomplete (38 cm x 19 cm).

Fig. 6 b. Another in-filled drawing of a deer, partially complete (34 cm x 19 cm).

Fig. 6 c. An incomplete figure of animal, possibly a humped bull. (25 cm x 10 cm).

Fig. 6 d. A thick dot (5 cm x 3 cm).

Fig. 6 e. Partly visible outline drawing of a bull (?). The tail, hump and lower portion of the body are clearly visible (29 cm x 17 cm).

Fig. 6 f. and Fig. 8. A complete figure of a humped bull. The head and neck upto the hump are filled in while the remaining portion of the body is decorated with vertical and horizontal stripes. The horns are upright (30 cm x 21 cm).

Fig. 6 g. and Fig. 8. Another complete figure of a humped bull. Partly decorated with lines and partly filled in (27 cm x 20 cm).



Fig. 3: Structural remains at Budagavi

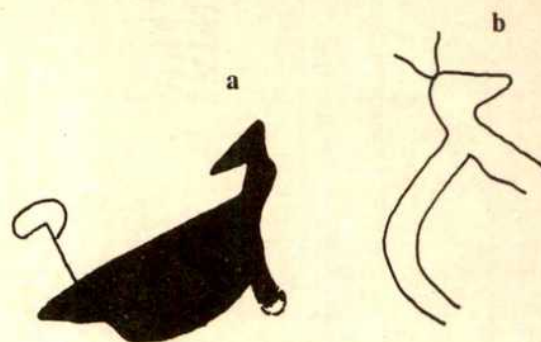


Fig. 4: Rock paintings at Budagavi

Fig. 6 h. and Fig. 8. Another complete figure of a humped bull. Here the bulky body portion is entirely decorated with a criss-cross design. The horns are short and upright (30cm x 21cm).

Fig. 6 i. A print of the left hand (30 cm x 8 cm) .

Fig. 6 j. An in-filled drawing of a cow (?). In this the snout is protruding and hump is low. The tail is shown slightly away from the body. The legs are missing (32 cm x 9 cm).

Fig. 7: a-c, f, h. Prints of the left hand (18 cm x 13 cm, 19 cm x 18 cm, 18 cm x 18 cm, 20 cm x 13 cm, 19 cm x 17 cm).

Fig. 7 d. Schematic drawing of a headless human figure. The arms are shown as a single horizontal line, the body as a long vertical line, the end of which is divided to indicate legs. The left leg is shown bent at the knee (20 cm x 10 cm).

Fig. 7 e. A thick line drawn at an angle. It could be a brush mark (16 cm).

Fig 7 g. A partially visible animal drawing in flatwash (17 cm x 16 cm).

Fig. 7 i. Another incomplete drawing of an animal in flatwash. The legs are shown in outline (24 cm x 16 cm).

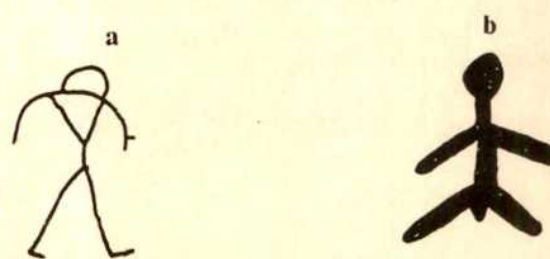


Fig. 5: Rock paintings at Budagavi

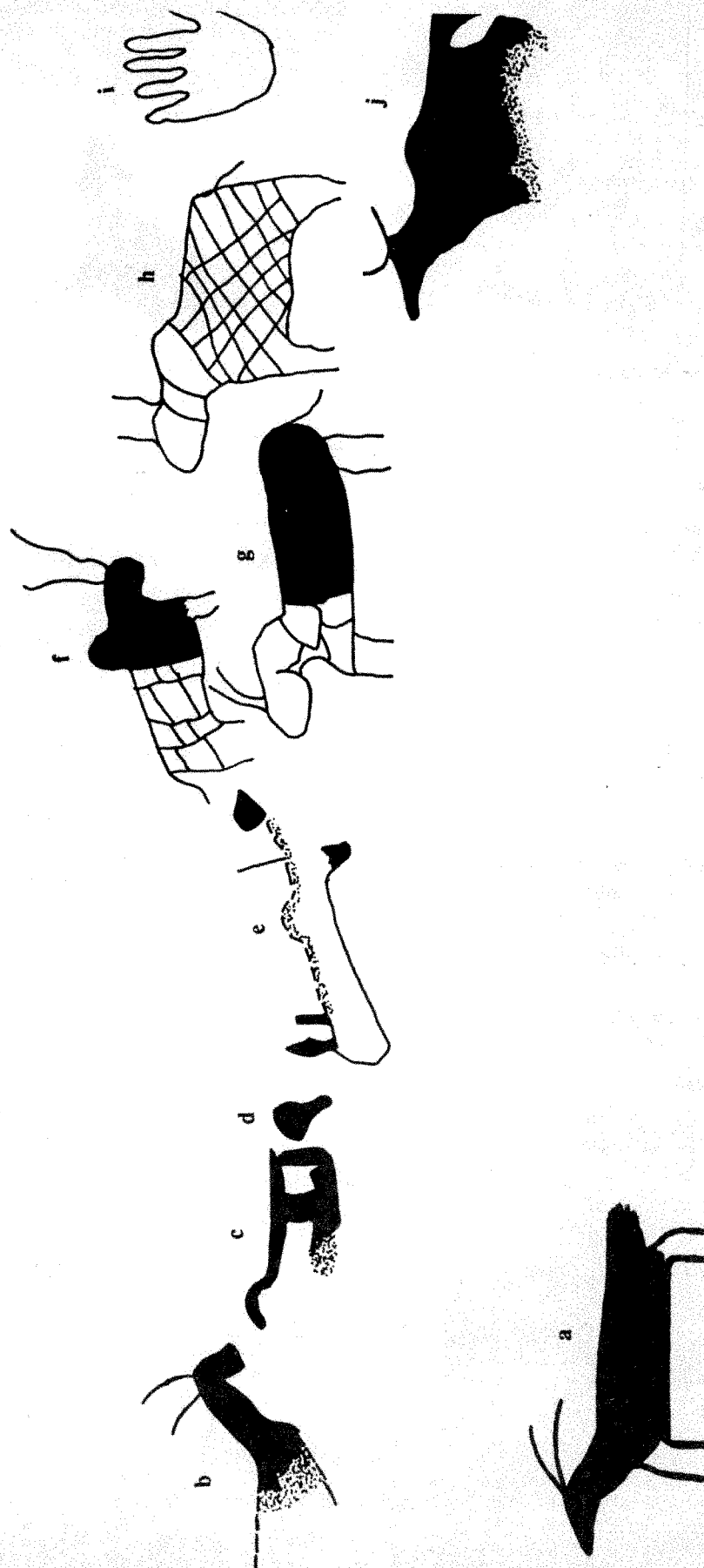


Fig. 6: Rock paintings at Budagavi

Rock Shelter 4 faces south and is located in front of and about 100 m away from Shelter 2. The paintings in this rock shelter are in a good state of preservation and consist of animal figures, a human figure, a hand print and geometric designs. Traces of extensive painting activity are visible in this rock shelter.

Description of the Paintings

- Fig. 9 a. Print of a left hand (13 cm x 6 cm).
- Fig. 9 b. A humped bull in thin outline. The body is decorated with curved lines. The hump is low (18 cm x 22 cm).
- Fig. 9 c. and Fig. 10. Another humped bull in thin outline. The hump is shown prominently. The body is decorated with three intersecting 'V'-shaped lines (44 cm x 48 cm).
- Fig. 9 d. and Fig. 10. Figure of a deer in outline. The body is curved. The head with antlers is beautifully drawn (23 cm x 17 cm).
- Fig. 9 e. An in-filled drawing of a human figure. The head is featureless. The legs and arms are outstretched. The left hand is shown holding a stick vertically (30 cm x 12 cm).
- Fig. 9 f. An incomplete schematic drawing of a bull (?) in outline (15 cm x 10 cm).
- Fig. 9 g. An inverted 'V' (9 cm x 9 cm).
- Fig. 9 h. A geometric design of one horizontal line over which 3 vertical lines are drawn, each at an angle (8 cm x 9 cm).
- Fig. 9 i. A geometric drawing of two inverted intersecting 'V's (19 cm x 22 cm).
- Fig. 9 j. Another inverted 'V' (10 cm x 10 cm).
- Fig. 9 k. A schematic drawing of a deer partially in-filled. The legs and head are filled in while the body is decorated with one horizontal and 4 vertical lines (22 cm x 30 cm).
- Fig. 9 l. A geometric design in thin outline (52 cm x 12 cm).
- Fig. 9 m. A bruising of an animal, possibly a bull (40 cm x 30 cm).

Artefactual Evidence

There is no habitational floor deposit in any of the four rock shelters. Only the surroundings of these rock shelters revealed some artefactual evidence. Close to Rock Shelters 2 and 3, two grinding stones and a stone axe were picked up along with a few pot sherds. The pot sherds consist of grey and red ware. Both are of the hand-made variety. This site yielded as many as 176 ground stone tools and pottery (Rami Reddy 1978: 66). Along with these, some microliths

were also reported from the same locality. No excavation has been conducted here so far.

Discussion

Budagavi is an important site, where evidence for human occupation begins with the Mesolithic and continues up to the Historical period when the hillock appears to have had a large population, as can be seen from the extensive habitational remains. There is also considerable evidence for Neolithic occupation in the form of stone tools, pottery and rock paintings. The Mesolithic phase is not well represented, but it is possible that due to the continuous habitation of the site and the resulting disturbance most of the Mesolithic artefactual remains might have been lost. The rock art data, though not extensive, provides some interesting points of study from the thematic and stylistic view points.

The total number of rock paintings from all the four rock shelters is about forty. It is, therefore, possible to construct a relative chronological sequence. On the basis of superimpositions, two phases can be made out. The white human figure (Fig. 2) in Rock Shelter 2 is superimposed on a red figure faintly visible, suggesting that the red figures predate the white ones. Among the red figures, on stylistic grounds, some drawings can be differentiated. The deer figures in Rock Shelter 4 (Fig. 9 d, k) are stylistically similar to the deer figures in red in the Kethavaram rock paintings which are tentatively dated to the Mesolithic period (Chandramouli 1986, 1987 and 1988). Similarly, the inverted 'V'-shaped geometric designs are seen in the rock paintings of Kethavaram. Traces of extensive paintings in Rock Shelters 2, 3 and 4 may be taken to represent the earliest phase (possibly Mesolithic) of painting activity here. Except for these figures, no other paintings in the Budagavi rock shelters may be dated to the Mesolithic, either on thematic or stylistic grounds.

Prominent among the paintings in red are the bull figures. The bull typifies Neolithic culture of South India. In the rock paintings and bruising of Kurugodu (Krishnamurthy 1977; Chandramouli 1974; Ganapayya Bhat 1981; Mathpal 1984) and Hire Benakal (Sundara 1968, 1974) the humped bull is the most frequently portrayed animal. However, the bull drawings here display certain interesting features. Unlike the lyre-shaped horns of the bull in the Neolithic — Chalcolithic rock paintings and bruising of the Karnataka sites mentioned above, the bulls' horns at Budagavi are straight and curved inwards. Further, the Chalcolithic pottery and rock paintings of Central India depict the bulls' hooves joined together, which is not the case here (Mathpal 1984 Pls. 15, 29; Neumayer 1978 Figs. 97, 98 and 99). Within Andhra Pradesh, the bull figures of Budagavi are quite distinct from the bull figures at Chintakunta (Cuddapah District) (Rami Reddy, 1971) Dupadugattu (Mahabubnagar District) (Fig. 11) and Budigapalli (Karimnagar District) (Krishna Sastri 1982). At all these sites the bull figures are

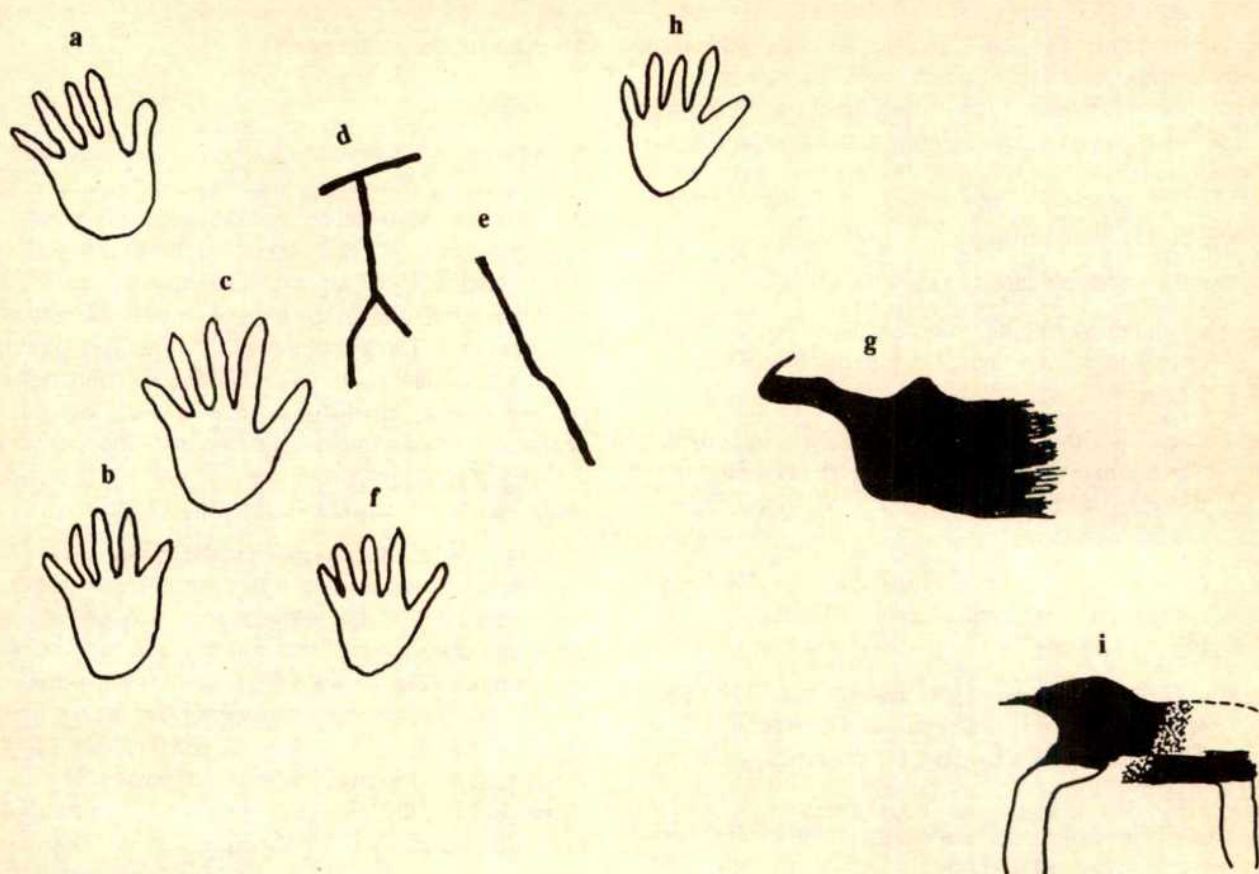


Fig. 7: Rock paintings at Budagavi

done in flatwash with hefty bodies, short/long curved horns. Though a few are done in outline the body designs so characteristic of the Budagavi bull figures are not to be seen in the bull figures from other sites. The depiction of the head, snout and hump of the Budagavi bulls is also quite distinct. On these grounds the bull figures of the Budagavi rock paintings may be said to belong to an early phase of the Neolithic. This is further substantiated by the material data. As stated earlier, ground and polished stone tools were reported in large numbers though the pottery is limited. Pottery of the Neolithic period at Budagavi mainly consists of blotchy grey ware and dull red ware, devoid of burnishing and decoration. Only 10 sherds of pottery of these two types were reported. The lithic blade industry- basically microlithic — does not reveal any characteristics of the Chalcolithic blade component typically found in the Karnataka sites. The finished tool component here consists of small, parallel sided blades, lunates, end scrapers, notched flakes, etc., made on chert, jasper and quartz (Rami Reddy 1978: 99). It is difficult to say whether such a microlithic tool industry is associated with the Neolithic at Budagavi but the evidence from other microlithic sites in Andhra Pradesh rules out such a possibility. Pending further study in this

direction, at this stage, it can only be stated that the Neolithic stone axe culture here is distinctly separated from the microlithic industry, which shows more Mesolithic traits than the Neolithic Chalcolithic blade tool industries. As such, the paintings of bull figures here may be said to belong to an early phase of the Neolithic where the use of pottery was minimal.

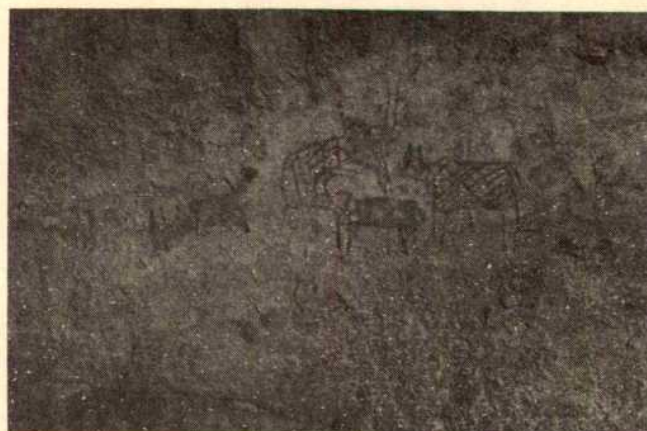


Fig. 8: Rock paintings at Budagavi

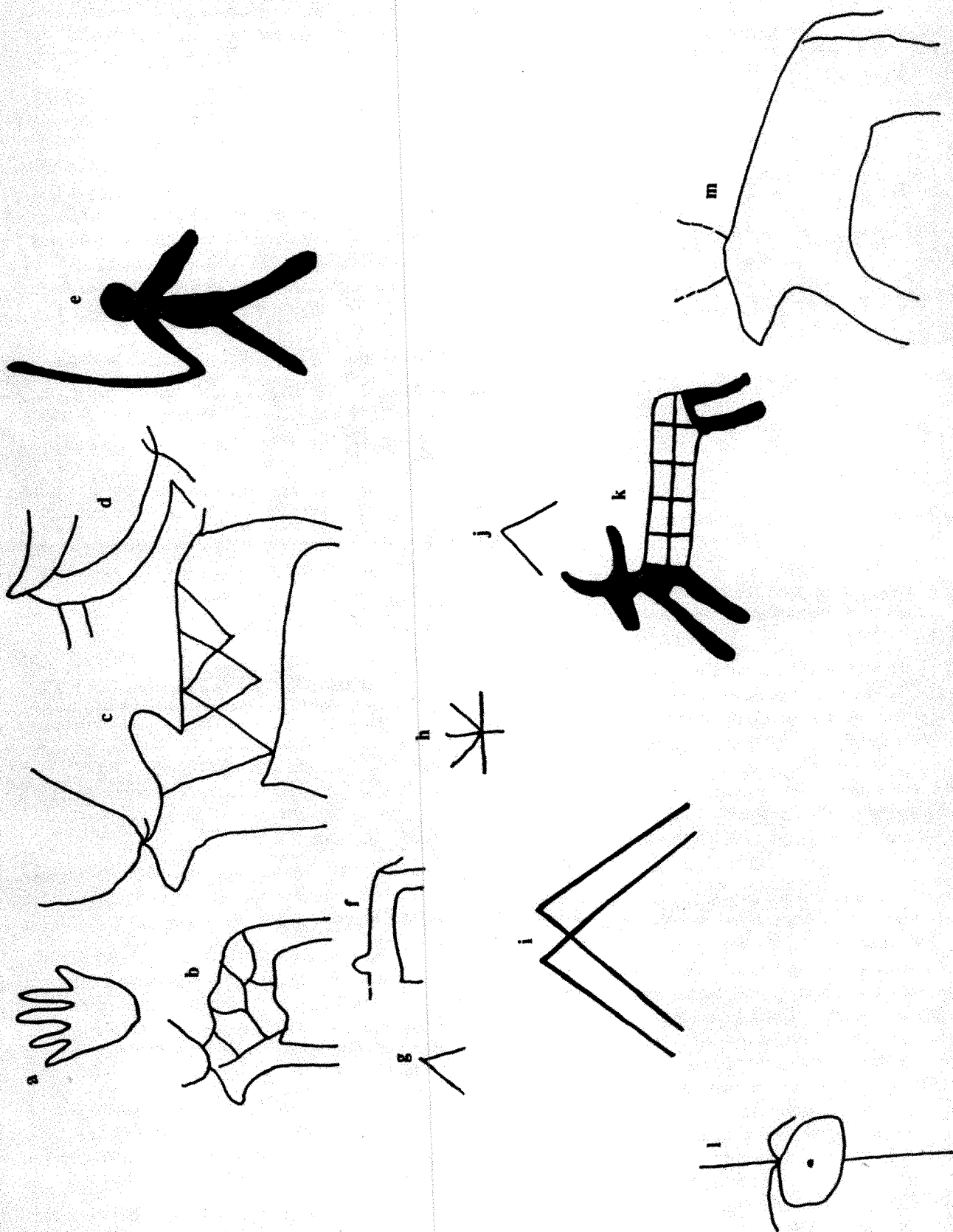


Fig. 9: Rock paintings at Budagavi



Fig. 10: Rock paintings at Budagavi

Conclusion

Thus, in the rock paintings three phases can be made out on the basis of theme, style and circumstantial evidence. The earliest paintings, though limited in number, may belong to the Mesolithic phase as indicated by the stylistic similarities with the Kethavaram rock paintings. However, in view of the limited rock art data, except for the two deer figures and geometric drawings mentioned above, no other paintings may be dated to this phase on thematic and stylistic grounds.

Among the remaining paintings almost all except the white human figures may be dated to the Neolithic period. In view of the limited number of paintings in white not much can be stated of their age except that they postdate the paintings in red. One interesting point to note here is that none of the rock paintings can be dated to the Historical period during which this site appears to have had a large human population, as seen from the extensive habitational evidence.

Style, as a parameter while considering the chronology for rock art, must be only tentative. As detailed above, at Budagavi the humped bull figures are stylistically very distinct. The humped bull figures from other sites in Andhra Pradesh are shown with hefty bodies, long or short curved horns, a long and prominent penis and are executed in flatwash (Fig. 11). These have no stylistic similarities whatsoever with the Budagavi humped bull figures. The bruising of humped bulls of the Karnataka rock art sites are very schematic with long bodies, almost a square-shaped hump, long and lyre-shaped horns and, in the majority of examples, face each other in a fighting posture. The Budagavi paintings do not reveal any such features. In this context it is interesting to note the bruising of two humped bulls from Velpumadugu, a Neolithic site about 10 km from Budagavi (Fig. 1). According to the investigator, they "are naturalistic, unlike those found at other sites in the South. The Velpumadugu bulls have long and slightly curved

horns... which do not show trifurcations like those of Piklihal and Sanganakallu... there are no crossing of their heads showing bull fighting, a scene characteristic of Piklihal specimens" (Rami Reddy 1971: 290).

In view of the fact that the rock art data from Budagavi and Velpumadugu show characteristic stylistic traits which are quite distinct from the humped bull paintings from other sites in Andhra Pradesh, as well as from the Central Indian painted specimens or the bruising of Karnataka, for the present it may be hypothesised that the Budagavi paintings may be of an early Neolithic date. However, much more data are required and more sites in this region need to be explored and excavated to provide evidence to test this hypothesis.

Acknowledgments

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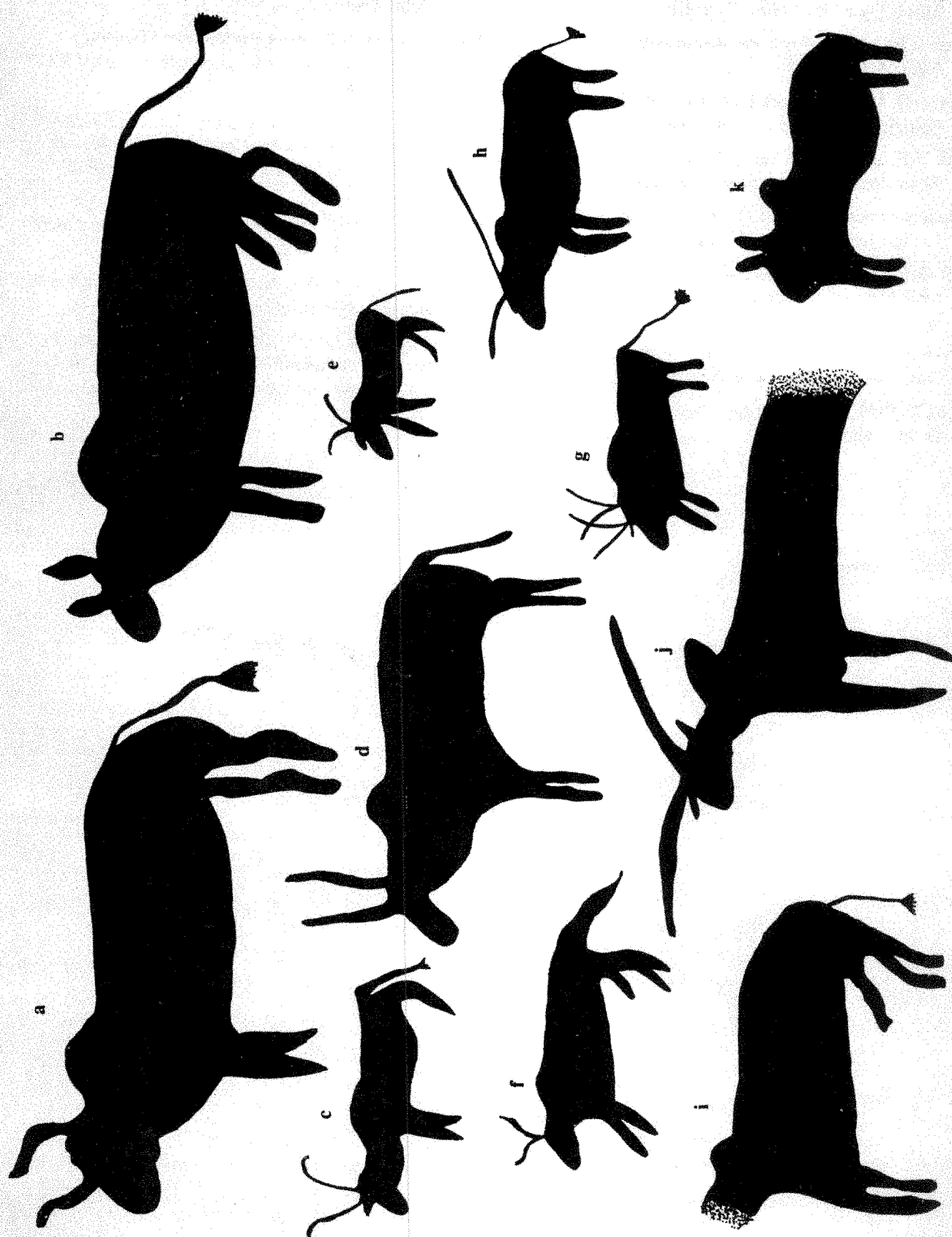


Fig. 11: Rock paintings at Budagavi

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Scenes of Head Hunting in the Rock Art of the Pachmarhi Hills

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Abstract

This paper describes the author's discovery of painted rock shelters in the Pachmarhi hills and, in particular, discusses scenes depicting head hunting.

Introduction

Situated in the folds of the Satpura Range, the Pachmarhi plateau (22° 29'N: 78° 30'E) lies 1200 m above MSL and is one of the most popular hill stations in Central India. The plateau was discovered in 1862 by Capt. J. Forsyth a British Army officer. He had been sent out to explore this part of the Satpura Range. Subsequently, a Sanatorium was established here for British army personnel and the place gradually grew into a proper cantonment town.

Administratively, Pachmarhi is now part of the tehsil of Pipariya, District Hoshangabad in Madhya Pradesh. The nearest railway station is Pipariya which lies on the Bombay-Jabalpur-Calcutta railway line.

The hills of the Satpura Range are formed of sandstone belonging to the Gondwana series of the Talchir Group. The typical Pachmarhi beds are uniform in character and consist of coarse, white and usually soft sandstone. As a rule the stratification is marked by oblique lamination and both partings and bedding plains are generally characterised by iron infiltration. The sandstones of Pachmarhi occur in the higher ranges of the hills and give rise to vertical scarps rising to 130 m.

The hills around the Plateau have thick vegetation comprising a wide variety of trees and plants thus making it a botanist's paradise. The wildlife here is also abundant, the area being a National Park and Sanctuary. It is not surprising to encounter a sloth bear, tiger or antelope in the thick forest where most of the rock painted shelters are located.

The mean daily maximum and minimum temperatures are 35.6° Celsius and 24° Celsius, respectively. December and January are the coldest months when mean daily maximum and minimum temperatures go down to 21.7°

Celsius and 5° Celsius, respectively. On an average there are 80 rainy days between July and September and the average annual rainfall is 71 mm.

Field Study

Pachmarhi is a complex of hills, waterfalls, caves and shelters which has made subsistence possible and secure for human beings for the past many thousands of years. The approach to most of the painted rock shelters is very difficult and demands a determined mind and fit body. The author has, in the past 2 to 3 years, discovered twelve painted rock shelters.

The existence of these painted rock shelters was first brought to the notice of D.H. Gordon by G.R. Hunter in 1932 when the latter carried out excavations there in 1932 and again in 1934-35. The later excavations revealed that the cultural sequence within this region began during the Mesolithic period. The rock paintings of this area are known to extend from the Mesolithic to the Historic period.

The rock paintings of the Mesolithic clearly depict a society of hunters and gatherers, and illustrate the relationship between man and animals. The compositional elements of these drawings are highly developed. The subject matter of this period is principally dominated by the variety of animal hunting activities.

Most of the rock paintings in the Pachmarhi hills, however, belong to the Historic period. The main subject depicted during this period is conflict, and scenes portraying clashes between two persons or groups are very common. The most likely cause of conflict could be the violation of territorial rights thus compromising a group's basic needs. The paintings depicting horsemen armed with swords and

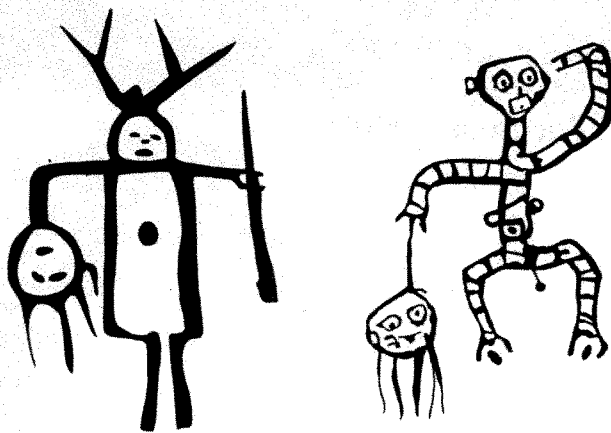


Fig. 1: Two petroglyphs of anthropomorphs, each holding a severed human head; from Huancor, Rock 34 (left) and Toro Muerto (right)

shields are superimposed on the earlier paintings portraying the life of hunters and gatherers.

The majority of the rock paintings are executed in red, white and yellow pigments, prepared from hematite or other iron oxides. The white pigments are made from limestone or "kaolin", while a mixture of pigments produced a pink colour used in these paintings.

A number of stylistic conventions have been used in the rock paintings. Some are only sketches or constructs of lines, while others are silhouettes in-filled with colours.



Fig. 2: Rock art at Langi Nadi Hill



Fig. 3: Rock art at Barkachar (Swam Aam)

There are hunting scenes, scenes of dancing and fighting, petroglyphs showing domestic chores, mother and child, as well as activities like fishing, honey collection, etc. There are also pictures of apparently deified animals.

The author found several depictions of severed heads in the rock paintings at Pachmarhi. The only country, other than India, where similar severed heads have been reported is Peru. Dr. Nunz of Cuba has discovered two anthropomorphic petroglyphs holding severed human heads (Bednarik 1989: 73) (Fig. 1).

The tradition of human sacrifice to appease the gods and goddesses has been documented amongst Indian tribes, particularly the Gonds and Korkus. Human sacrifice used to be performed by tribals in the Mahadeo Hills till as late as the 19th century. For example, in 1822 a European officer (Forsyth 1989: 180-4) witnessed the sacrifice of a visitor made at the *Kal Bhairav* shrine. *Bhairav* is one of the many names of Lord Shiva. In India shrines to Shiva are the oldest and most famous of all. Forsyth (1989: 179) also describes a scene where he witnessed devotees hurling themselves off a cliff, obviously offering their lives to Lord Shiva.

The rock paintings provide further evidence of human sacrifice. These depictions are identical and have been found



Fig. 4: Rock art at Nagdwari Shelter

only in four shelters of the Pachmarhi area.

The author is of the view, that warring factions be-headed the vanquished enemy and carried away the heads as war trophies to show the folk who had stayed behind. There are scenes showing a man holding a human head in one hand and a weapon in the other, and he seems to be running away and looking backwards, giving the impression that he is being chased by the enemy. Such depictions of head hunting are prominent in the shelter located in Langi Nadi hill. The painting is 50 x 50 cm (Fig. 2). It is a bichromatic painting, in-filled with white and outlined in red.

The rock shelter at Barkachar (locally called Swem Aam) also contains a pictograph of a head hunter (Fig. 3). This figure is 30 x 30 cm and is contained within a mural of seemingly unrelated figures.

Another shelter depicting head hunting is known as Nagdwari (Fig. 4) situated approximately 35 km from Pachmarhi town. The paintings in this shelter are similar in style to those found at Swem Aam and Langi Nadi.

The maximum number of figures of head hunters have been found on the rock shelter at Rajat Prapat. These paintings (Fig. 5 and 6) show three men, each holding a head while running in the same direction (right to left) looking back over their shoulders.

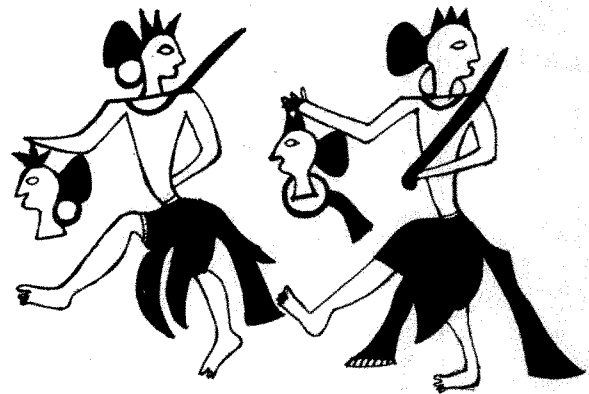


Fig. 5: Rock art at Rajat Prapat Shelter

It is interesting to note that all the four paintings pertaining to head hunters are in-filled with white and outlined in red. All the figures have sharp features and are well proportioned. The men wear some form of head gear, earrings and a loin cloth. The severed head is held in the right hand and a sword in the left hand. It is remarkable that all the "head hunters" are shown escaping or running in the same direction, i.e. from right to left and are looking backwards over their shoulders. All the hunted heads have head gear, earrings and a necklace (?) similar to those of the head hunters.

According to Wakankar (1987) the hill tribe communities in the Pachmarhi hills were hunters till the 10th century A.D. It appears that they abandoned this practice due to the influence of Hindu *sadhus* (saints) who penetrated the deep forest to perform penance in the Pachmarhi hills.

The author is of the opinion that the rock paintings depicting head hunters (Figs. 1, 2, 3 and 4) belong to the Early Historic period. This is based on the following evidence:

- (a) the head hunters hold a sword-like weapon, which clearly indicates the use of metals like iron, prevalent during the Historic period, and
- (b) a radical change is also noticed in the paintings of this period. By this time the artists' perception had remarkably improved and careful attention is paid to anatomical details which were lacking in the earlier periods.

It is interesting to note that in each of the head hunter pictographs found in India and Peru, there is a striking similarity between the hunter's head and that of the hunted, both in the type of decorations and colours used.

Details of Head-Hunters in the Rock Paintings

Sr. No.	Name of Rock Shelter	Head-Hunter	Type of Activity	Sex	Special Feature	Clothing	Head Type	Colour	Position	Elevation	Equipment	Total	Technique	Size
1.	Langi Nadi	One	Solo	Male	Eyes, nose, mouth, earrings, crown	Skirt	Round with top-knot	White and red	Running	Facing left looking backwards	Sword	1	Red outline white in-filled	46 x 49 cm
2.	Neemgiri	One	Solo	Male	Eyes, nose, mouth, earrings, crown, necklace	Skirt	Round with top-knot	Off white and red	Running	Facing left looking backwards	Sword	1	Red outline white in-filled	56 x 37 cm
3.	Rajat Pratap	Three	Group	Male	Eyes, nose, mouth, fingers, toes, earrings, crown	Loin-cloth	Round	Off white and red	Running	Facing left looking backwards	Sword	3	Red outline white in-filled	45 x 26 cm, 40 x 24 cm, 36 x 21 cm
4.	Swam Aam	One	Solo	Male	Eyes, nose, mouth, earrings, crown, toes	Loin-cloth	Round	White and red	Running	Facing left looking backwards	Sword	1	Red outline white in-filled	27 x 27 cm



Fig. 6: Rock art at Rajat Prapat Shelter

Conclusion

It would not be out of context to mention incidents of head hunting amongst groups in conflict. The Nocte and Wanchu tribes in North Eastern India used to behead their enemies and display the skulls as war trophies in their clubs (locally called Morangs). Some of these tribals wear brass replicas of the head(s) as pendants, to indicate that their ancestors were warriors and hunted a specific number of the enemy. So that a person wearing two pendants meant that his ancestor had beheaded two enemies, thus exhibiting the deeds of valour of their forefathers (Gazetteer of Arunachal Pradesh).

Since time immemorial men, either as individuals or within groups have been involved in warfare with the sole motive being survival. Only the means to fulfill this have changed. The depiction of head hunters seem to be indicative of conflicts amongst prehistoric man. Head hunting clearly implies death of the enemy or annihilation of the group attacked and is a sign of proof of clear victory over the enemy. The rock paintings depicting these scenes are probably memorials to such events.

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A Horn-Headed Human Figure on a Harappan Jar from Padri, Gujarat

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Abstract

Horn-headed figures, earlier reported from two Harappan sites in Sind and Rajasthan, have been interpreted by some as the representation of *pasupati*, "Lord of Beasts". The discovery of a more or less similar horn-headed figure from another Harappan site at Padri in Gujarat is, therefore, significant and suggests that they were connected with the religious beliefs of the people and perhaps were worshipped almost all over the Harappan empire. The figure on the jar from Padri would appear to be that of a male and is unique for its artistic execution.

Introduction

The village Padri Gohil ni lies roughly 8 km west of Talaja, the taluka headquarters and 50 km south of Bhavnagar, the district headquarters. The ancient settlement, 2.5 km south of the present village, is locally known as *Kerala-ne-Dhoro* (which means habitat of the *kera* fishing community). New features like rectangular mud structures similar to those unearthed in the Chalcolithic sites of the Deccan and a new painted ceramic called "Padri ware", have been brought to light from the present excavation. Prior to the excavation, the villagers, while digging for soil to use in the construction of their house walls, had unearthed three intact painted storage jars. The author subsequently ascertained the precise find spots of these jars.

Of the three jars recovered, the largest one bears a drawing of a human figure wearing a horned head-dress (Fig. 1). This jar is very thick in section and was made from a very fine levigated clay. A considerable amount of very fine-grained marine sand was also mixed with the clay. According to the present-day potters in the nearby village of Talasara, to achieve a uniformly high firing temperature it is necessary to use sand as a tempering material. The jar is globular in shape with a beaded rim and small flat base. It is 81 cm high with a circumference of 2.34 m. The jar was turned on a fast wheel, but a close examination reveals that the body was made in two separate parts and was luted together. The rim also appears to have been made separately and then joined to the body. The brick red core of the jar and the metallic ring, when struck, suggest an even firing to a high temperature.

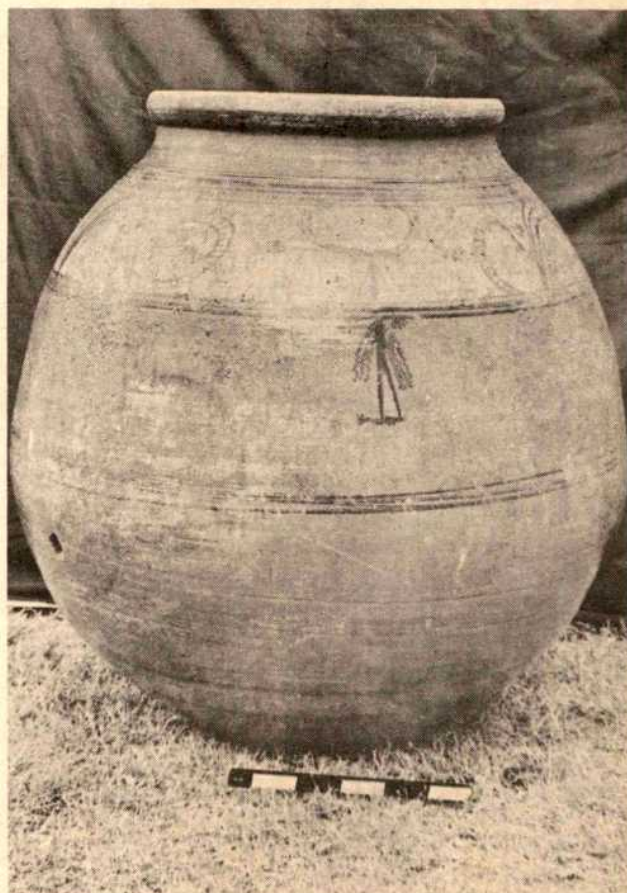


Fig. 1: A Harappan storage jar decorated with a horn-headed human figure

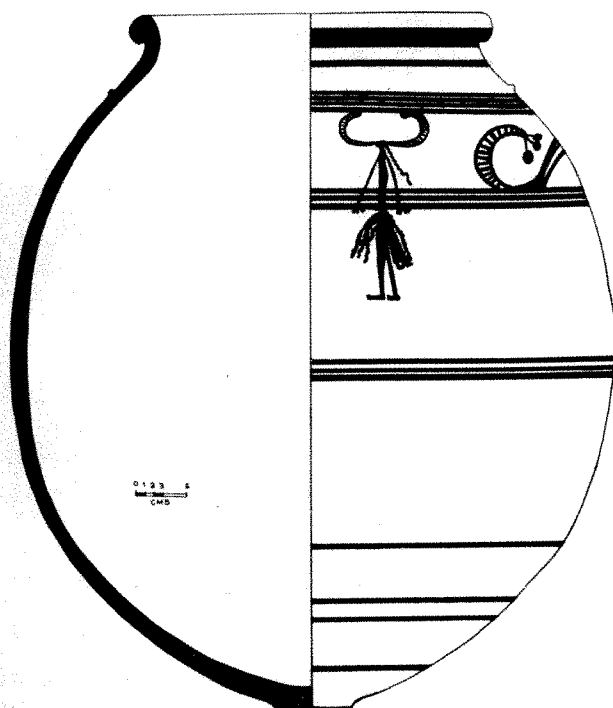


Fig. 2a: Drawing of the storage jar decorated with horn-headed human figure

This storage jar is mainly a dull red colour with four bands of a light yellow-orange colour and of uneven width. The bands in the upper part of the jar are separated by sets of three horizontal black lines. The second and widest of the light yellow-orange coloured bands is 12 cm and the black painted decoration is restricted to this band (Band 1) and the wide expanse of the red band (Band 2) below it.

Band 1 incorporates a standing human figure with a horned head-dress (Fig. 2a), the horns of which resemble those of the bulls of the *kankrej* breed which are found only in Saurashtra and Kuchch.

In Band 1 only the upper half of the figure is seen, while the portion below the waist extends into Band 2. The head of the figure is represented by a small solid ellipse crowned by a pair of large curved hatched horns, each measuring 14 cm in length and touching the upper border of this panel. The braided hair, 7 cm long, is seen on the figure's left. The torso and the hands are all 8 cm long. The figure is wearing a garment represented by wavy lines and resembling a grass skirt. This measures 7 cm and extends from the waist to the knees.

The figure is probably a male because the genitalia are visible through the skirt. The legs are solid and 9 cm in length. The height of the figure is 18 cm and with the head-dress it measures 25 cm.

The decorative motifs extend from either side of the

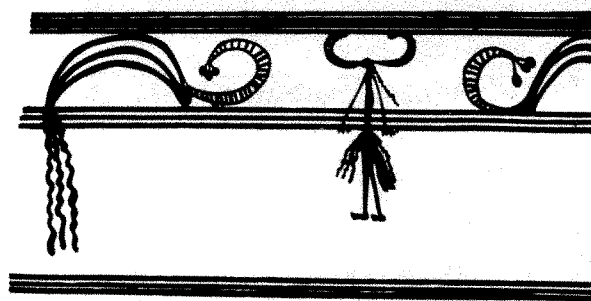


Fig. 2b: A horn-headed human figure and a design on either side resembling a plant motif

figure around most of the surface of the jar. The pattern is repeated twice to the right of the figure and three times on the left. The design comprises three wavy vertical lines which rise out of Band 2 and converge in the band of three horizontal black lines. From here three bold black crescentic lines are formed. At the point where they converge again a horn-like hatched projection extends outwards ending in what resembles a tassel.

Band 1 and Band 2 give an impression of being land and water surfaces respectively. The figure, therefore appears to be standing in water. The almost continuous semi-circular pattern on either side of the figure is confined to Band 1 whereas the vertical wavy lines extend beyond it and probably represent some kind of water plant with its leaves above the water and roots below it. The horned figure appears to be in motion with its right leg and hand brought forward (Fig. 2b).

A somewhat similar figure, but in a seated posture and surrounded by an elephant, a tiger, a rhinoceros and a buffalo, noticed on one of the Harappan seals (No 420) from Mohenjo-daro in Pakistan, has been identified as the prototype of the Hindu deity 'Siva' (Mackay 1938, Pl. XCIV). In Hindu mythology 'Siva' is described seated in a yogic posture with a trident (*trishul*), as an emblem always associated with him. The head-dress of the figure on the seal from Mohenjo-daro, composed of two horns and a tall central portion, is suggestive of the shape of the trident. The group of animals around this figure evoke Siva's later aspect as *pasupati*, "Lord of Beasts" (Srinivasan 1975-76). During Caspers (1989), however, questions this identification in view of its rare depiction. A human figure wearing a horned head-dress incised on a terracotta cake at Kalibangan in Rajasthan (Lal 1979) closely resembles the Padri motif, though the former is represented by incised lines only. The painted motif from Padri is very significant and could, most probably, be associated with the religious beliefs of the Harappans in Saurashtra. The horned human figure on this jar could be identified as that of a *pasupati*, surrounded by nature.

During Caspers (1989) is of the opinion that these horned human figures signify the existence of an ancient hunting cult with rites and practices which may have become blurred with the passing of time. She further states that they may well mark the presence of a minority group of basically non-Harappan inhabitants whose original home has to be sought in one of the regions to the north of the Great Indus Plains, present-day Afghanistan, the Kashmir region or western Nepal. This explanation is hard to accept because the evidence from various Harappan sites points to the existence of a very strong system of state organization, one of the characteristic features of which is the presence of a priestly class and a religious ideology. The sporadic occurrence of idols or motifs of religious importance, could possibly be attributed to the fact that the right to manufacture and possess such objects of religious importance was available only to people of a very high social ranking in society at that time. With the discovery of a horn-headed figure in Gujarat, there is hardly any doubt that the worship of this deity was prevalent almost all over the Harappan empire. To what extent certain customs or traditions of a small local tribe would have influenced the urban Harappans, spread over a very vast territory, is a matter of debate. Had the hunting cult been prevalent amongst any local tribe in Sind, its influence is unlikely to have been felt in places as far off as Rajasthan and Gujarat.

The discovery of the motif of a horned deity on a Harappan storage jar from Padri suggests an early date for the Harappans at Padri, but the ceramic assemblage resembles that of Rojdi B, which has been dated to 2200-2000 B.C. (Possehl and Raval 1989: 171).

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De Terra and Paterson and the Soan Flake Industry: A New Perspective from the Soan Valley, Northern Pakistan

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Abstract

The paper re-examines the evidence presented by De Terra and Paterson (1939) for the Pleistocene and palaeolithic sequence of the Soan Valley, in what is now Pakistan. We conclude that none of their conclusions can be sustained. We find no evidence that river terraces exist in the Soan Valley, and reject De Terra's relative chronology for the sequence of claimed terraces and associated exposures of palaeolithic artefacts. We also find no support for Paterson's claims of a pre, an early, and a late Soan Flake Tradition: none of the assemblages he studied can be dated, even relatively to one another, and most are probably mixtures of materials of different ages. We suggest that a fresh start is made, based primarily upon the absolute dating of artefacts within secure geological contexts.

Introduction

Since 1939, lower palaeolithic work in both India and Pakistan has been largely based on the monograph, *Ice Age Studies of India and Associated Human Cultures*, published by De Terra and Paterson (1939). Their fieldwork took place in 1935 in the Soan Valley near Rawalpindi, the foothills of Kashmir, the Narmada Valley, and also the Bombay area. The Soan Valley was by far the most important area where they worked, since it seemed to contain the most complete succession of Pleistocene deposits, and the widest range of (apparently) associated stone industries. It was largely on the basis of their work in the Soan, in March and April of 1935, that they formulated their main conclusions. These were i) that the earliest ("pre-Soan") stone industries dated to the beginning of the Second Himalayan Glaciation, which they correlated to the Mindel Glaciation in Europe; ii) that throughout most of the Middle Pleistocene, there were two main stone-working traditions in this area — a flake-based "Soan industry", and a core-based Acheulian one; and iii) by the early part of the Upper Pleistocene, the Soan flake industry had evolved gradually into a "Late Soan", which included some prepared-core techniques. Overall, therefore, the dominant impression was of a highly conservative and simple flake-based industry, which co-existed for a while with an independent Acheulian industry, in much the same way as the Clactonian flake industry co-existed with the Acheulian in southern England.

The longevity of De Terra and Paterson's work stands out as a notable exception to the generally high turn-over of ideas and conclusions in Palaeolithic archaeology. The reason is quite simple: between 1939 and 1980, virtually no major palaeolithic work took place in Pakistan, and the little that did simply added to, rather than re-appraised, their results. For obvious political reasons, Indian prehistorians have been unable to visit the Soan Valley since 1947, and consequently, have had to accept De Terra and Paterson's observations in the Soan at face value.

Since 1981, we have been re-examining De Terra and Paterson's results. In our opinion, they were wrong with regard to both the Pleistocene geology of the Soan, and its palaeolithic sequence. As will become clear, we feel that their results obstruct rather than aid understanding of the early palaeolithic in this region, and we recommend a completely fresh start.

De Terra's Pleistocene Sequence

De Terra's sequence is summarised in Fig. 1. His aims were: first, the identification of deposits either directly (e.g. moraines) or indirectly (e.g. terraces, loess and erratics) related to Quaternary climatic change; second, the development of local sequences which could provide relative chronologies for the glaciated and unglaciated areas of northern India; and thirdly, the regional correlation of these sequences. The key to his chronology lay in the assumption

Depositional Unit		Correlation with Alpine glacial sequence
Pink loam/silt/gravel	Terrace 4	4th glaciation (Würm)
Thin loam	Terrace 3	3rd interglacial
Potwar Loessic Silt	Terrace 2	3rd glaciation (Riss)
Upper Terrace Gravel	Terrace 1	2nd interglacial
----- erosion/tilting -----		
Boulder Conglomerate		2nd glaciation (Mindel)
----- erosion/tilting -----		
Pinjor Beds		1st interglacial
Tatrot Beds		1st glaciation (Guns)
----- UNCONFORMITY -----		
Dhok Pathan		

Fig. 1: Relative chronology of Pleistocene deposits of the Potwar Plateau, according to De Terra and Paterson (1939)

that similar sequences in different areas were synchronous. Throughout his work in India, the Boulder Conglomerate played a central role as a marker horizon.

The Boulder Conglomerate

The correlation of the Siwalik "Boulder Conglomerate" with the second Himalayan glaciation lies at the heart of De Terra's chronology. By equating this deposit with a glacial phase, De Terra was the first to identify a climatically-related deposit within the Siwalik sequence. This apparent breakthrough enabled him to link the Boulder Conglomerate to the Mindel Glaciation in the European Alps. However, his assumption that all Boulder Conglomerate was of the same age, was to prove a fatal weakness in his chronology, for he did not consider the possibility that these deposits might be either of different ages or time-transgressive. More alarmingly, De Terra applied the term "Boulder Conglomerate" to a 90 m thick post-Siwalik conglomerate within the Soan syncline, rather than to the underlying, folded, Upper Siwalik Conglomerate. As we will demonstrate later, it is this error that has been responsible for the considerable confusion that surrounds the Soan sequence.

In identifying the glacial deposits of northern India, De Terra followed Dainelli (1922) in recognising four main phases of glaciation, but preferred an early Pleistocene age for the earliest glacial phase. De Terra and Paterson argued for an early Pleistocene ("first interglacial") date for the Lower Karewa beds on the basis of palaeontological evidence. They continued: "The folding of these beds... was simultaneously recorded by the disturbance of the Older Siwalik beds, which are unconformably overlain by Boulder

Conglomerate. This conglomerate, merging into morainic outwash represents the great fan stage which Dainelli assigned to his second glaciation... Moreover, the fauna of the Boulder Conglomerate and of its equivalents in central India is of Middle Pleistocene type, which argues against a later date, as do also the archaeological records... The great dividing line is the fan or Boulder Conglomerate stage, which separates lower and Upper Pleistocene, and this corresponds to the maximum glaciation of the Pir Panjal" (1939: 214-215). Note in this quotation that the faunal evidence was in fact very poor — especially in the Soan — and second, the implicit circular argument that artefacts could be used to date the Boulder Conglomerate, which in turn was used to indicate the Middle Pleistocene age of the artefacts.

In the absence of glacial moraines, De Terra's sequence for northern Pakistan rested on the identification of deposits that could be correlated with the glacial sequence of Kashmir, namely, erratic blocks, loess deposits, and in particular, terrace sequences. The first two can be considered briefly:

Erratic Blocks

The so-called erratic blocks of the northern Punjab attracted the attention of several geologists. Wynne (1879, 1881) and later Cotter (1933) explained those found near Attock in terms of catastrophic flooding by the Indus, although Coulson (1938) favoured ice-rafting. De Terra and de Chardin (1936: 794) identified gravel deposits in the Attock area as fluvio-glacial outwash containing "large erratic blocks and glacially faceted boulders... which can be traced back to the mountain front", and related this deposit to the Boulder Conglomerate, and therefore to the Second (Mindel) Glaciation of the European Alps. The consensus these days is that Wynne and Cotter were probably correct, and De Terra and De Chardin were not (Rendell *et al.* 1989: 7-20).

Loess

De Terra recognised loess (his "Potwar loessic silt") as a glacially-related deposit in the Potwar from the Third (Riss) Glaciation by the following chronological argument: i) "the Potwar silt in the Soan area is cut into by a terrace, which is the third in a uniformly observed system of five terraces"; ii) "in Kashmir we found terrace 3 cut into the moraines of the third glaciation"; iii) "It is our suggestion that the Potwar silt originated during the third glaciation"; and iv) "This relationship with the glacial cycle would speak in favour of the windblown origin of the Potwar silt" (De Terra and de Chardin 1936: 814).

Thus the loess of the Soan Valley was thought to be of the same age as some of the glacial moraines of Kashmir: once again, similarity of sequence denoted synchronicity of age. In this particular case, the alleged contemporaneity of the loess and a glacial moraine enabled De Terra to link a

particular type of deposit to a specific type of climate. However, recent work on the Potwar loesses show that most belong to the last glaciation (Rendell 1988).

De Terra's River Terrace Sequence in the Context of the 1930's

De Terra's reliance on terrace sequences for glacial and interglacial correlations was very much in keeping with Pleistocene geology from the 1920's to 1950's. River terraces were commonly used to correlate Quaternary sequences of areas that were not glaciated, and palaeontological evidence, where available, was used to confirm the general validity of regional correlations. During the interwar years, the general validity of Penck and Bruckner's (1909) four-fold Alpine glacial sequence seemed confirmed by data from Britain and North America. The importance of northern European glacial sequences was further reinforced by the discovery of apparently matching sequences of wet or "pluvial" phases in terrace sequences along the Kagera and Vaal rivers in eastern and southern Africa (Sohng *et al.* 1937; Wayland 1934)

The use of terrace sequences as indicators of climatic

change tended to be weak in two important respects. The first was the issue of tectonic instability, and the second concerns the assumption that glacials and pluvials were synchronous. Both issues were highlighted by Zeuner (1946, 1959), one of the most thoughtful critics of the time. His writings show considerable scepticism over the assumption that terrace sequences were necessarily caused by climatic rather than tectonic factors; even if they were, he also argued that those in tropical areas need not have been synchronous with those in dry-temperate regions (Zeuner 1950: 42 and 1959: 47).

Although De Terra recognised that the sequences and landforms he was studying reflected the interaction of climatic and tectonic agencies, his identification and interpretation of the terrace sequence in the Soan Valley was entirely climatic. Again, his work has to be judged in the context of its time. Like many of his contemporaries, he opted for studying climatic change by assuming (or hoping) that the imprint of climatic events on a landscape would obscure tectonic ones. In retrospect, he was unfortunate in working in one of the most tectonically-active areas in the world.

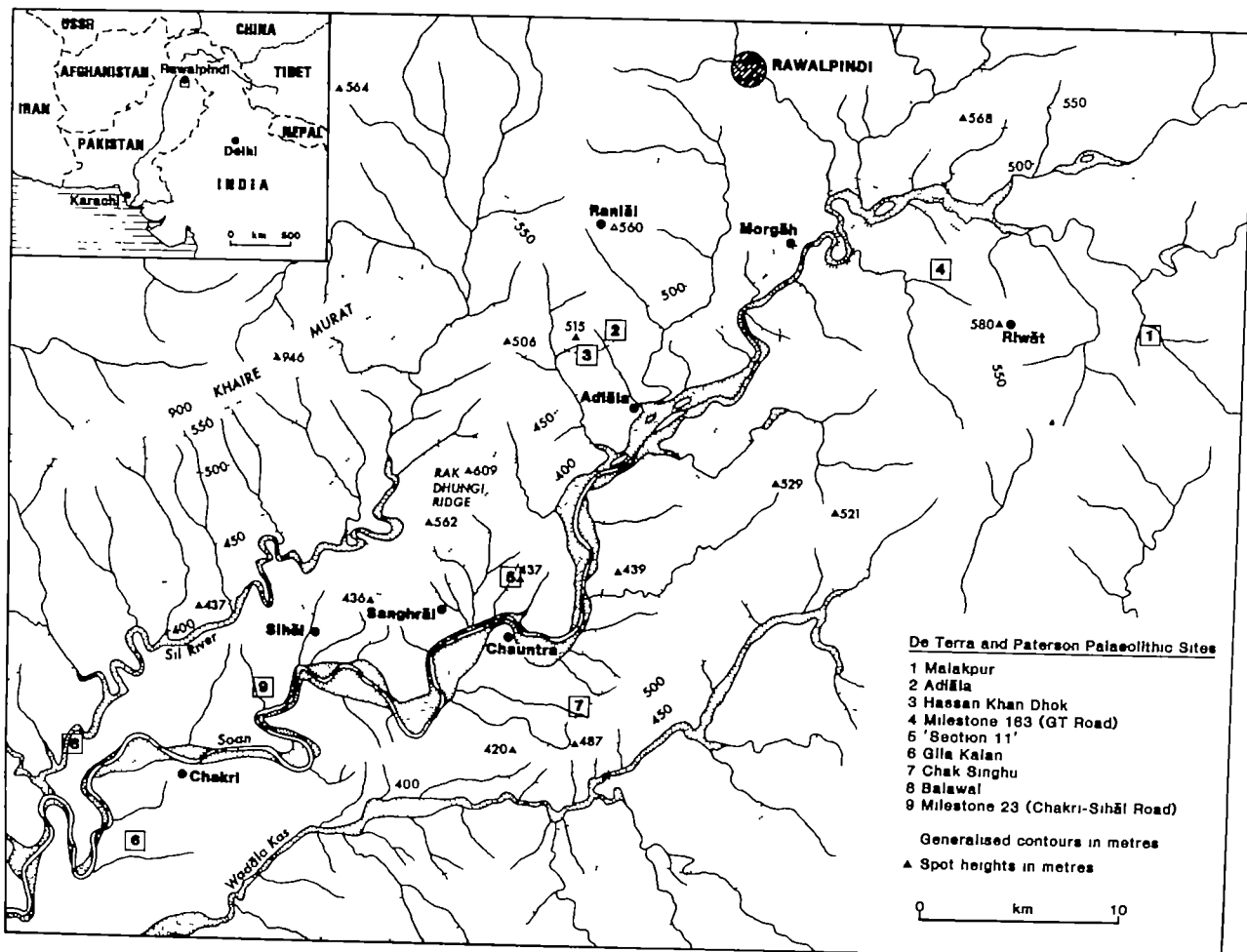


Fig. 2: Location of the palaeolithic sites on the Potwar Plateau that were investigated by De Terra and Paterson (1939)

The Soan Terrace Sequence and Associated Palaeolithic Sites

The Pleistocene chronology of the Middle Soan valley was based on the identification of four terraces, post-dating De Terra's "Boulder Conglomerate", and therefore younger than the Second Glaciation. The terraces were correlated in turn with the second interglacial (T1), third glacial (T2), third interglacial (T3), and fourth glacial (T4). This sequence provided a relative chronological framework for the palaeolithic assemblages studied by Paterson. Close examination of De Terra and Paterson's text reveals that evidence of the terraces is far more elusive than one might expect. Although a generalised section is presented of the terraces above Chauntra (1939: Fig. 177), De Terra and Paterson (1939: 282) admitted that no terraces were seen in the key area of the Soan Valley, southeast of Rawalpindi. In addition, terraces are marked specifically on only four of the 14 stratigraphic sections (1939: Figs. 162-175) which accompany the descriptions of the terraces and palaeolithic sites. The idealised figure of the terrace sequence at Chauntra is literally too good to be true.

The Soan Valley Sites

De Terra and Paterson identified nine main sites or areas of palaeolithic artefacts within the Middle Soan valley (Fig. 2).

At Malakpur, a "late Soan Industry" was found at the base of a section of loess at the junction with planed-off beds of tilted Dhok Pathan conglomerates. De Terra and Paterson (1939: 284) commented "undoubtedly these (artefacts) were manufactured on a terrace (?T3) which at that time was less dissected than now". Their argument was as follows: late Soan industries require a younger terrace; therefore, if late Soan industries are present, there must also have been a younger terrace (i.e. T3). There is, in fact, no evidence at all of a terrace at Malakpur, and all that this section indicates is that the assemblage was older than the loess, and younger than the underlying (Miocene) Dhok Pathan strata.

The same is true of the sites north of Adiala and near Hassan Khan Dhok, where artefacts were again found at the junction between the planed-off surface of Middle Siwalik conglomerates and the overlying loess. These two sites yielded "Late Soan" and rolled "Early Soan" artefacts and one rolled "Abbevillian-like hand-axe". Although they speculated that the pebbles and gravel represented a fluvial deposit, "the implements are somewhat rolled, but not so much that we must necessarily assume river transport" (De Terra and Paterson 1939: 285). De Terra and Paterson (1939: 286) commented at some length on the relationship between the underlying conglomerates and the artefacts, remarking that: "This deposit provided the Soan people with ideal raw material (quartzite pebbles) for the manufacture of tools; in fact, all these sites are so closely associated with outcrops of Middle Pliocene conglomerates that one can

almost predict sites wherever this formation underlies the peneplain".

These remarks echo Wadia's earlier comment that struck stones are found wherever suitable raw material is encountered (Wadia 1928: 346). They also highlight De Terra and Paterson's dilemma: were they studying deposits that were exposed when artefacts were made and discarded, or fluvial deposits in which stone tools were incorporated? It is this relationship between palaeolithic sites and sources of raw materials that gives us the key to understanding the distribution of palaeolithic sites in the Soan Valley, and to realising their difficulties in dating them.

These uncertainties are clear in De Terra and Paterson's evaluation of the "Milestone 163" site (or complex of sites) which yielded three "cultural layers" related to the "Boulder Conglomerate" and the overlying "Potwar gravel" and "Potwar loessic silt". The upper few inches of the Boulder Conglomerate contained the oldest industry represented by rolled crude hand-axes of Acheulian type, and "pre-Soan" flakes. De Terra and Paterson (1939: 282) continued: "very probably the conglomerate at this horizon is an old surface or terrace remnant of T1". The basal gravel associated with the loess contained "Early Soan" tools while fresh flakes of "late Soan B" were found in the base of the loess. The relationship between the Milestone 163 complex and the terrace sequence remains unclear since "the Soan... has here denuded the terraces, some of which reappear a few miles downstream" (De Terra and Paterson 1939: 282), with only the oldest horizon tentatively associated with T1. Their assertion is that if a terrace had existed here, it would have had a very early date, thus confirming the apparent age of the artefacts.

In contrast, at the section 11 site, across the Soan to the north of Chauntra, worked pebbles of "Early Soan" type were found on a conglomerate ledge. De Terra and Paterson (1939: 287) commented that "the high altitude of this terrace ledge suggests that this is T2 of Third Glacial Age". This remark contradicts their earlier observation that "the right bank (of the Soan) above Chauntra carries what looks like dissected remnants of a uniform terrace level, but there is no way of telling whether this is not merely a ledge of resistant gravel above the Pinjor clays" (De Terra and Paterson 1939: 276). Given their ambivalence, there is no reason to accept their dating of this locality.

At Gila Kalan, a "Soan workshop" was discovered on the surface of the "Boulder Conglomerate", and covered by "Potwar loessic silt". De Terra and Paterson (1939: 292) commented that "the surface of this conglomerate is planed and may well represent T2". There seems to be no reason to accept this assertion. The only conclusion allowed by their observations is that this locality pre-dates the loess and lies on a conglomerate of indeterminate age.

The Chak Singhu locality proved more complex since

"no terrace flats are preserved in the neighbourhood (of the gravel ridge)... adjacent to this gravel ridge lies a pinkish sandy silt in which were found some 100 artefacts of Abbevillian and Acheulean type" (De Terra and Paterson 1939: 290). As far as the age of this site is concerned, De Terra and Paterson (1939: 290) argued: "The ridge gravel can belong only to a fill stage during which the then less dissected slope was buried by ancient Soan drift...it would represent a terrace gravel of Third Glacial age... while the adjoining sandy silt must be Third Interglacial, representing a thin deposit of T3. Accordingly, the early palaeolithic handaxes were embedded in a Third Glacial deposit and redeposited in the following interglacial stage, together with Late Soan tools".

This reasoning is a good example of the kind of circular argument used to construct their terrace chronology: typologically early implements must have been derived from an early deposit, which in turn has to be early because it contained early-looking types of artefacts.

The Balawal site comprises a cemented gravel patch resting unconformably on Middle Siwalik strata (including conglomerates) and overlain by "Potwar loessic silt". The site is related to T2 in a figure (Fig. 173A) but not in the main body of the text. As at Malakpur, Adiala and Hassan Khan Dhok, the only confident statement that can be made about the age of this locality is that it is older than the loess but younger than the Miocene.

The Milestone 23 (Chakri-Sihala road) yielded "pre-Soan Flakes" in association with the conglomerate, "clearly proving the stratigraphic value of these artefacts in differentiating between terrace gravel, Boulder Conglomerate and Pliocene conglomerates" (De Terra and Paterson 1939: 292). However, this association is not defined, and it is unclear whether these artefacts were on or in this conglomerate. One suspects the former, as it was a surface locality, and no mention is made of any excavation. Once again, it seems that stone artefacts were found on a surface of unknown age. There is also little reason to accept the "pre-Soan" as humanly-struck (Stiles 1978).

Thus four sites, if Balawal is included, appear to be related to outcrops of (quartzite-bearing) Middle Siwalik conglomerates; a further four are related to De Terra and Paterson's "Boulder Conglomerate", and are tentatively linked to Terrace 1 in one case, and to Terrace 2 in the others. Finally, the Chak Singhu site is related to Terrace 3.

The evidence put forward by De Terra and Paterson fails to sustain the existence of any link whatsoever between Pleistocene river terraces and palaeolithic sites. Terrace sequences in the Middle Soan Valley appear to be highly fragmented, and, for the most part, erosional features. All the archaeological evidence is based on surface collections, and artefacts cannot be associated with secure stratified contexts. Although the attribution of particular sets of

artefacts to particular terraces enabled De Terra and Paterson to construct their palaeolithic chronology, we have found no basis for these attributions. Therefore, and quite simply, Paterson's palaeolithic sequence is wrong. On the evidence presented by De Terra and Paterson, the only point that is clear is that **palaeolithic artefacts are associated with outcrops of quartzite-bearing Middle and Upper Siwalik conglomerates, or with spreads of quartzite pebbles and cobbles derived from these conglomerates.**

The Boulder Conglomerate in the Soan Valley

De Terra correlated the "Boulder Conglomerate" of the Soan Valley with the "Boulder Conglomerate" of Kashmir, and with the Upper Siwalik "Boulder Conglomerate" of Pilgrim (1913). Unfortunately, he made a serious error in his mapping of the Soan syncline fold structure. He followed Wadia (1928: Plate IX, Fig. 1) in interpreting the fold structure as **symmetrical**, and with steeply dipping limbs. The fold is, however, strongly **asymmetrical**, with a steeply dipping northern limb and a gently dipping southern one. Only later was this structure mapped correctly by Gill (1952: 386), who remarked on the subsequent confusion: "De Terra's restriction of the term "Boulder Conglomerate" to a formation which has a maximum thickness of about 300' is somewhat confusing in the field, since the term could perhaps be more appropriately applied... to the 2-30000' of Siwalik conglomerate below". Gill pointed out that the confusion over the structure of the syncline, and the relationship between Siwalik and post-Siwalik strata is heightened if sections are drawn with vertical exaggeration. To emphasise this, Gill's sections through the syncline are compared with De Terra and Paterson's in Fig. 3.

De Terra's mapping error was compounded by his association of the post-Siwalik limestone rich conglomerates on the northern limb of the synclinal fold with Siwalik quartzite conglomerates on the southern limb. He speculated that this difference in composition could be explained by different source area (De Terra and de Chardin 1936: 799). In fact, as Gill (1952) pointed out, there is no need to postulate two ancient rivers in the Soan, each with a distinctive sediment type, as the two conglomerates are of different ages.

Neither De Terra nor Wadia (nor us) was helped by the virtual absence of diagnostic fossils in Upper Siwalik deposits exposed along the Middle Soan Valley. Therefore, until the development of radiometric and palaeomagnetic techniques, the stratigraphic correlation of the Soan sequence with other areas depended totally on the colour, texture and association of deposits, as revealed in sections, and their similarity, or otherwise, to sequences elsewhere. Lithological correlations of this kind are dangerous in sequences like the Siwaliks: deposits are often highly variable laterally; many Siwalik sequences are repetitive so that deposits are not time-specific; and for tectonic reasons,

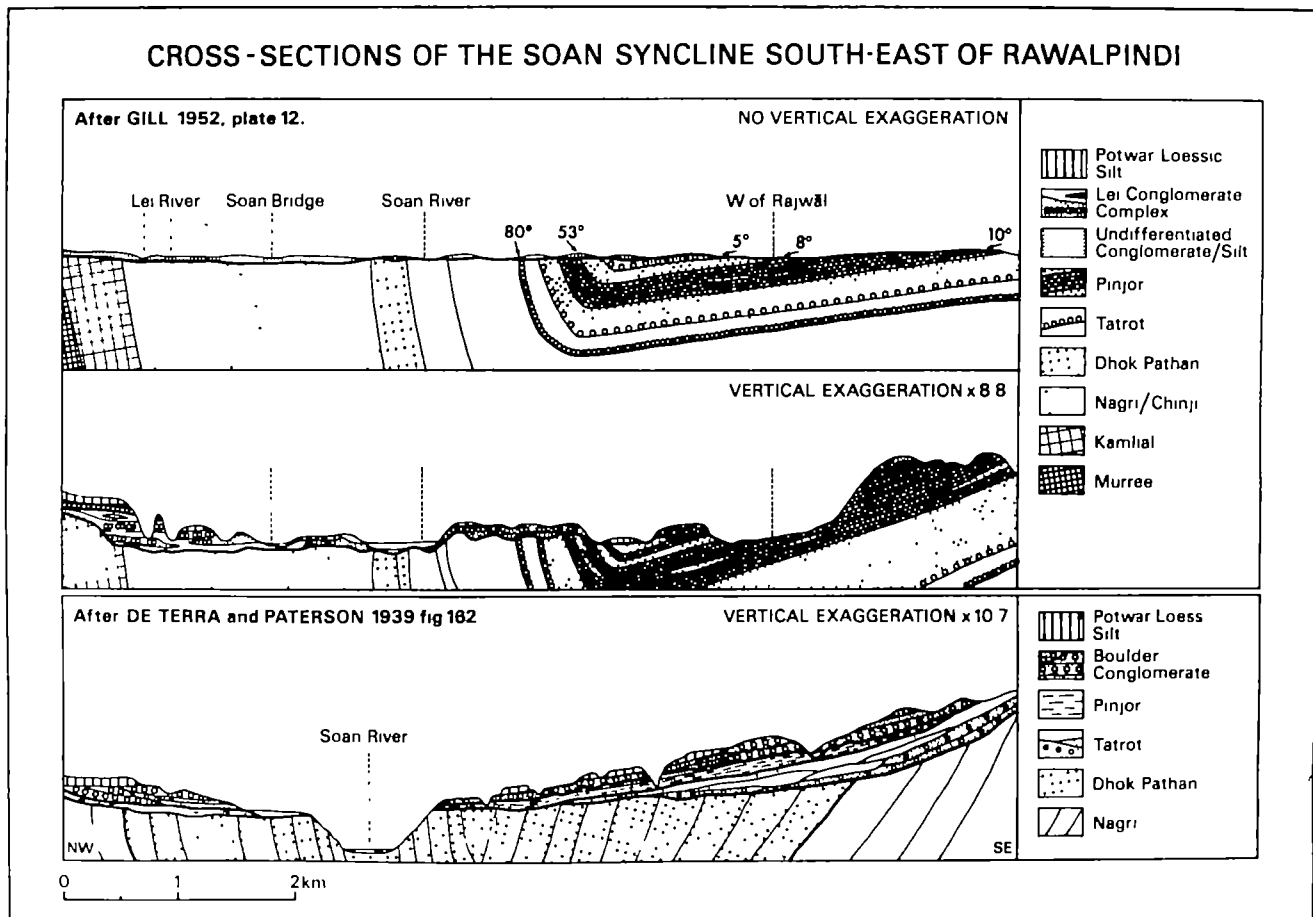


Fig. 3: Cross-sections of the Soan syncline south-east of Rawalpindi, according to De Terra and Paterson (1939) and Gill (1952)

many of the deposits — especially the “Boulder Conglomerate” are time-transgressive.

Paterson and the Soan Flake Industry

Although Paterson is best remembered for his one season of fieldwork with De Terra in 1935, his main work was on the Clactonian assemblages of southern England, particularly those from Barnham St. Gregory. The relevance of this research to the Soan Flake Industry has been consistently — and regrettably — overlooked. One reason is that he does not refer to it in his monograph with De Terra; a second is that in Europe, his work was soon superseded by that of post-war scholars. This European work is, however, of fundamental importance in understanding his conclusions on the flake assemblages of the Soan Valley in 1935.

In 1935, Paterson held a research studentship at Cambridge, and was thus a contemporary there of Louis Leakey. At the time, both were heavily influenced by contemporary work by French prehistorians. A key figure here was Breuil, whose work on lower palaeolithic assemblages from a long sequence of river terrace deposits in the Somme valley (Breuil and Koslowski 1931; Breuil 1939) was one of the major palaeolithic studies of the 1930's. This

study indicated a long and gradual “progressive” development of the Acheulian through 11 distinct stages, defined largely by the extent of rolling and patination, and evidence of refinement in terms of artefact-thinning and retouch.

Breuil's studies strongly influenced three other major, Cambridge-based investigations into long-term palaeolithic sequences. The first was by Louis Leakey, who argued for a similar sequence of 11 stages of increased refinement for the early palaeolithic sequence from Olduvai Gorge in East Africa. (Although this was not published until 1951, it was undertaken at the same time as De Terra and Paterson's, and would have been published in 1939 had not war broken out).

The more important studies, in terms of Asian archaeology, that show Breuil's influence were Paterson's, in both southern England, and the Soan Valley. At Barnham St. Gregory, England, Paterson collected an assemblage of flake tools from the top 60 cm of a gravel horizon. Rather than treating these as one unit, he divided them into four groups, distinguished by their typology, state of wear, and patination. As Breuil showed progressive evolution, so did Paterson: “The Barnham sequence of the Clactonian shows progressive and continuous development of technique” (Paterson and Fagg 1940: 28). In greater detail, he also suggested

that there was: "a series of industries, showing a progressive development along indigenous lines, uncontaminated by contact with other culture techniques. The technique evolves continuously in the production of finer flakes, prepared with increasing skill. More shapely tools are produced and finished with progressively finer retouch. At the same time the angle of striking platforms decreases, the bulb increases in depth, and simple facetting of platforms appears... New forms of tools appear towards the end of the series but their origin is seen to lie in previous types" (Paterson 1937: 135).

He did exactly the same in the Soan Valley, where he collected assemblages from what he (erroneously) thought were a distinct series of terrace deposits: "Just as in the Abbevillian-Acheulian cultures there is an evolutionary trend toward finer and neater forms of hand axes, so in the Soan pebble tools there can be traced a development toward smaller and more finely made types" (De Terra and Paterson 1939: 312).

As in southern England: "The early Soan tools differ in patination and state of wear and have therefore been divided into three groups, here termed A, B and C... The earliest, A, is heavily patinated... and thoroughly worn... Group B is patinated like A but not worn at all, and Group C is less patinated and fairly fresh" (De Terra and Paterson 1939: 305). He similarly divided the "late Soan" industries: in late Soan A, "some of the specimens are worn", whereas those of late Soan B were "exceedingly fresh and unworn" (De Terra and Paterson 1939: 309-310).

Not surprisingly, he came to exactly the same conclusions as at Barnham St. Gregory: "In the early stages the flakes are crude and simple, often rather Clactonian-like in appearance, with primary flaking of a very haphazard nature. In the late Soan, alongside the simple forms, there are other flakes, showing a development in technique, with much more regular primary flaking and often with faceted platforms, denoting careful preparation of the core in a manner reminiscent of the Levalloisian. Retouch, when necessary for the type of flake implement required, is much finer, but with the improvement in technique flakes and blades were produced with so fine and regular an edge that retouch was rarely needed" (De Terra and Paterson 1939: 311-312).

Interestingly, the weakness in his argument was recognised at the time by Oakley and Mary Leakey. They detected no change in their Clactonian assemblages from a similar riverine context to that at Barnham St. Gregory, and suggested: "there is often little justification for taking the degree of rolling as a *prima facie* criterion of relative age... Tools deriving from contemporary workshop sites located by the riverside at irregular intervals down a valley would tend to be transported downstream in course of time to an extent largely dependent on accidental circumstances. Thus at a given place the artefacts incorporated in a river deposit might be of exactly the same type, but in various states of wear" (Oakley and Leakey 1937: 237).

Oakley and Leakey's study was prophetic in anticipating matters that are now considered part of modern taphonomic studies. Their suggestion also torpedoed attempts by Breuil, Leakey, Paterson and others to demonstrate lithic improvement from river gravel assemblages that were not of demonstrably different ages. Assemblages from the same layer *cannot* be separated (as Paterson did in both southern England and the Soan) into chronologically distinct entities on the basis of wear, patination or even shape.

The Soan and the Acheulian: Two Cultures or One?

Paterson discussed the apparent co-existence of two lithic traditions in southern England in greater detail than he did in the Soan. His explanation was that tools are made to set patterns acquired by individuals as part of a social or ethnic group, and thus different types of stone tools or stone-working techniques indicated the presence of different groups. In one of his papers on the English Clactonian, he thus suggested that "Acheul man has come into contact with Clacton man and absorbed some of the core and flake technical methods. This would account for the degenerate character of the core element, even though developed types of cores are present" (Paterson and Fagg 1940: 23). Likewise, he even depicted "Soan choppers of the Upper Brecklandian Acheul" (Paterson and Fagg 1940: Fig. 15): the implication being that someone had gone from the Soan to Suffolk and discarded a tool. Why, not to mention how, such long-range discard was practised was left unexplored.

It is thus hardly surprising that he identified two groups in the Soan: one using a technology based on flakes, and the other using hand-axes. That these were seen in terms of distinct groups is seen in his later suggestion that the Soan at one time contained two groups: one, peaceable, vegetarian flake-users, and the other, an aggressive bunch of carnivores using hand-axes (Paterson and Drummond 1962: manuscript prepared 1940). Alternative explanations, such as that bifaces were used along with flake tools, were not considered.

Interestingly, he later disowned his earlier conclusions. In his final major (and very thoughtful) paper on the concepts used in palaeolithic research (Paterson 1945) he argued that the concept of "culture" was inappropriate to palaeolithic studies because there was (and always would be) insufficient data: "It is exceedingly doubtful if the word can be applied to any archaeological group of complexes prior to historical times" (Paterson 1945: 3). So too with the concept of an "industry": "Even in the Lower Palaeolithic, where so often more than one technique is used, the use of "industry" is not absolutely justifiable, since, for all we know as yet, each technique may be associated with a different complex" (Paterson 1945: 3).

Conclusions

We suggest that the work of both De Terra and Paterson has

to be seen in the context of its time, and — unsurprising after 50 years — as entirely outdated. After eight seasons of fieldwork in the Soan Valley, we see no reason to accept either De Terra's conclusions on the Pleistocene sequence of the Soan Valley, or Paterson's on its palaeolithic sequence. Likewise, we cannot accept Paterson's concepts of a "pre-", "early" and "late Soan", as none of these is in even a relative sequence to one another, let alone derived from secure geological contexts. Moreover, we find it hard to accept any subsequent work that was based on their initial investigations of 1935, whether in Pakistan or India.

We conclude that an entirely fresh start needs to be made in investigating the Plio-Pleistocene and Palaeolithic sequences of northern India and Pakistan. What has to be kept in mind is that the area is highly unstable tectonically, and so it is highly improbable that the geological deposits contain a sequence reflecting climatic change alone. Secondly, many units are time-transgressive, and thus units such as the Boulder Conglomerate cannot be used as marker horizons. Instead, each local sequence has to be dated independently by palaeomagnetic and radiometric dating techniques. Finally, extreme care must be taken to ensure that artefacts are found in secure geological contexts that can be dated, and are recorded in as much detail as possible before removal from their matrix in the field. Recent examples from northern Pakistan are the handaxes from Dina and Jalalpur that are between 500,000 and 700,000 years old (Rendell and Dennell 1985), and the artefacts from Riwat, south-east of Rawalpindi, that have been dated to c. 2.0 Ma old (Rendell *et al.* 1987; Dennell *et al.* 1988).

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The Mesolithic and Hunter-Gatherers: Myths and Meanings

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Abstract

Recent investigations of the European Mesolithic have brought to light evidence from southern Scandinavia to show that this period can no longer be viewed as one of degeneration or decline. On the contrary it was more likely one of innovation, interaction and successful adaptation among the early post-glacial hunter-gatherers of northern Europe.

Introduction

There are two messages in this paper, two myths to be explored, two points to be made. The first message is that the European Mesolithic was not a period of degeneration, of quarantine, of recession, between the glories of the Upper Paleolithic and the arrival of enlightened farming populations in Europe. For the most part, the European Mesolithic was a very dynamic time of change and innovation. This argument is made by considering the current evidence from the late Mesolithic of southern Scandinavia.

The second message in this paper is that hunter-gatherers in the past did not always follow a pattern of simple, mobile, and small. That is, hunter-gatherers did not always exhibit simple levels of organization, live in very small groups, and move constantly around the landscape. There are numerous examples in the ethnographic record to suggest more permanent groups that had more complex forms of organization. Small and mobile is likely to be appropriate for more recent hunter-gatherers in very marginal environments. Such a characterization may not be appropriate for many groups of foragers in the past. The archaeological evidence from northern Europe is also used to elaborate this point.

The Mesolithic of Southern Scandinavia

The term Mesolithic ("Middle Stone Age") is used to designate those societies of hunter-gatherers present during the period between the end of the Pleistocene and the beginnings of agriculture in Europe. The end of the Pleistocene is conventionally set at 10,000 B.P.; the earliest Mesolithic assemblages in the northern part of Europe date

from ca. 9500 B.P. The end of the Mesolithic is marked by the introduction of agriculture between 6000 and 5000 B.P. in this area. In the most northerly areas, above the limits of cultivation, hunter-gatherer adaptations continued until very recent times and such adaptations are often simply referred to as "stone age".

In general terms the technology of the Mesolithic of northern Europe was both diverse in form and specialized in function, involving the use of items such as the bow and arrow, domesticated dogs for hunting, water transport in the form of canoes and sea going craft, and a variety of fishing gear such as nets, hook and line, weirs, and traps. Ground stone artefacts appear as axes, celts, plant-processing and wood-working equipment and other tools. Projectile weapons were armed with a vast array of specialized tips made of bone, wood, antler, and stone. Ceramics appear in the late Mesolithic, probably (?) as an idea borrowed from Neolithic farmers in Central or Eastern Europe.

The chronology for the Mesolithic of northern Europe is based primarily on lithic typology, radiocarbon dating and pollen analysis. This chronological framework has been heavily revised and enhanced in recent years resulting in changes in or abandonment of previously well regarded terms. The Mesolithic chronology for southern Scandinavia is now divided into three major periods with at least 12 minor subdivisions. Intriguing shifts in techniques of manufacture, classes of raw material, and types of artefacts are seen within a relatively brief span of time (Vang Petersen 1984). For example, bone scrapers replace flint ones during a several hundred year period of the middle Mesolithic; techniques for making blades alternate between the use of hard- and soft-hammers; forms such as flaked stone

axes from the very earliest Mesolithic reappear again in the late Mesolithic.

Projectile points evolve rapidly over time from triangular to trapezoidal to transversal forms (Fischer 1989). Two processes are apparent in this evolution: (1) stone projectile tips become narrower and more symmetrical around the shaft of the arrow, and (2) a narrow pointed tip evolves toward a broader cutting edge for the leading end of the arrow. This emphasis on a broader edge provides more killing power. Arrowheads with a broad leading edge drive bone and other tissue ahead of them causing additional damage, rather than slicing neatly through tissue like a knife.

There are a variety of materials other than stone in use during the Mesolithic, most of which have not been preserved to the present. Underwater excavations at the submerged site of Tybrind Vig in central Denmark have provided a remarkable glimpse of the preserved wood, bone and fiber components of this technology (Andersen 1980). This Mesolithic settlement on the west coast of the island of Fyn lies today at a depth of 2-3 m beneath the waters of the Baltic. Some 6000 years ago the site stood on the shoreline of a small estuary. Evidence is present at the site for summer, autumn and winter residence, making year-round occupation likely. The bones of numerous mammals and fish were found in the deposits around the site. Seals, porpoises, and whales were hunted at sea from this site, but it is fish, particularly cod, spurdog and eel, that were of primary importance in the diet. Carbon isotope analysis of both human bone and food residues in pots from the site document the predominance of marine species in the diet.

A variety of fur-bearing mammals were represented, including pine marten, wildcat, fox, otter, badger and polecat (Trolle-Lassen 1987). In almost every case these fur-bearing animals were represented by articulated clusters of bones, suggesting that they were not eaten but discarded as whole carcasses. Cutmarks from stone knives on the mandibles and skulls of these animals represent the traces of skinning. Fatal fractures on the rear of the skulls represent blows from either the trapper or the traps that captured these animals. Clearly the furs of these animals were of primary importance, perhaps for exchange as well as local use.

Among the artefacts of organic material were found a wide range of fishing equipment: a bone hook with a fibre line still attached, leister prongs, fish traps, wires and fences, along with two dugout canoes and a number of paddles. One of the canoes is particularly impressive, with a length of 9.5 m, hollowed from a lime tree. The rear portion of the canoe contains a small fireplace, likely used for attracting eels at night. This boat could have carried six to eight individuals and their equipment. Canoe paddles of ash have a heart-shaped blade and provide the first evidence in Europe for the decoration of wooden objects. A curvilinear, symmetrical design was cut into the blade of the paddles and filled with a brown coloring material. Finally several pieces of textiles

and ropes, woven from threads of plant fiber, provide further evidence of the array of equipment and materials in use during the Mesolithic.

Settlement and Subsistence

Through the early Holocene in northern Europe, subsistence activities were intensified, settlements became more permanent, exchange systems developed and elaborated and regionalization became more pronounced (Price 1985). Wild foods provided sustenance to populations throughout northern Europe, but the specific composition of diet was largely a function of settlement location. Moreover, there is increasingly good evidence from a number of areas to document both local variation and regional similarities. Major differences are seen between coastal and inland adaptations.

By the middle Mesolithic, settlements are more sedentary and the majority of sites are found in coastal situations. A number of different types of sites are known from the late Mesolithic, including (1) coastal occupations, containing both marine and terrestrial fauna, with or without associated shell middens. The shell middens appear to be largely long-term, episodic accumulations of seasonal activities. The shell midden at the type site of Ertebolle is a good example of such accumulations (Andersen and Johansen 1986). (2) Smaller, seasonal coastal sites with a more specific procurement focus — deep water fishing, sealing, or fowling for migratory species such as swans. (3) Inland trapping stations with large numbers of intact carcasses from fur-bearing animals such as pine marten. And perhaps (4) inland lakeside settlements that may be year-round occupations. Year-round occupation at both coastal and inland sites appears likely during the Ertebolle. The occurrence of cemeteries in Zealand and southern Scania at this time complements this picture of more sedentary residence and suggests increased social and ritual complexity (Larsson 1990, Price 1985).

The Ertebolle, or late Mesolithic, period represents the culmination of several trends in the Mesolithic of southern Scandinavia. Technological elaboration accompanies the development of the Mesolithic in southern Scandinavia (Blankholm 1987, Price 1985). More artefact types and facilities, and more complex facilities, are known than from earlier periods; previous forms become more functionally specific. A great array of wood, bone and antler tools is in use by the Ertebolle period. The appearance of ceramics in this period provides dramatic evidence of such innovation, as well as of contact with Neolithic groups to the south. Water-craft in the form of dugout canoes up to 10 m in length provide for the movement of people and goods along the coasts (Andersen 1980).

An intensification in food procurement can be traced through the Danish Mesolithic. The appearance of shell middens in the middle Mesolithic, the diversity of extraction camps, the faunal remains of a wide range of marine fish and

mammals, including seals, dolphins and whales, and the utilization of "species-specific" trapping stations, all combine to demonstrate the diversity of the subsistence base. The number of species represented at Ertebolle sites is some 50% greater than in the early Mesolithic.

Recent investigations of Mesolithic diet in southern Scandinavia (Price 1989, Tauber 1981) have altered a bias toward terrestrial foods that dominated earlier views. The importance of marine resources in northern Europe has been seriously underestimated. Tauber (1981) used carbon isotopes in human bone to examine the importance of marine resources in the diet of the inhabitants of Mesolithic and early Neolithic Denmark. Mesolithic hunter-gatherers in southern Scandinavia have been assumed to have been largely dependent on terrestrial resources. Although a variety of marine foods, including fish, seal and whale bones, were found on sites from this period, their contribution to the diet was thought to be relatively small. However, analysis of carbon isotope ratios in the Mesolithic hunter-gatherers were comparable with those of Greenland Eskimo where marine foods contribute more than 75% of the diet. Thus, it appears that Mesolithic hunter-gatherers only supplemented their diet with terrestrial foods. Carbon isotope ratios in the Neolithic farmers were clearly representative of terrestrial foods, documenting a dramatic shift away from the sea and the importance of domesticated plants and animals in the diet. Archaeological evidence of substantial quantities of fish bone at coastal sites and the presence of marine mammal bones at inland sites in Jutland (Andersen 1975) reinforces the impression of the importance of marine resources in the diet of the Mesolithic inhabitants of northern Europe.

Cemeteries

Cemeteries are a recent hallmark of the Mesolithic, unknown in northern Europe prior to 1975. A few isolated graves had been reported in the literature but it was not until the discoveries at Vedbaek, Denmark (Albrethsen and Brinch Petersen 1977), and at Skateholm in southern Sweden (Larsson 1980), that the presence of substantial graveyards was recognized.

At Vedbaek in northeastern Zealand, a Mesolithic cemetery was uncovered in 1975 during the construction of a school. The cemetery is dated to approximately 6000 B.P. and contains the graves of at least 22 individuals of both sexes and various ages. Powdered red ochre was used to adorn individuals in many of the graves. Racks of red deer antler were placed with elderly individuals; males were buried with flint knives; females were often interred with jewelry of shell and animal teeth. In one grave, a newborn infant was found buried on the wing of a swan next to his mother. The mother's head had been placed on a cushion of material such as animal skin. The infant was buried with a flint blade, as were all males in the cemetery. The cemetery

also contained rather dramatic evidence for conflict and warfare. The simultaneous burial of three individuals in a single grave — an adult male with a lethal bone point through his throat, an adult female, and a child — suggests the violent death of all three.

Excavations at Skateholm in southern Sweden have uncovered at least three cemeteries within the same former estuary, dating from the late Mesolithic (Larsson 1989). Skateholm I contained at least 57 graves with some 62 individuals, as well as 8 dog graves. Skateholm II, only partially excavated, held at least 22 graves, and an unknown number of graves were found nearby at Skateholm III some years ago. Almost every imaginable type of burial has been found here, including cremations and inhumations. The inhumation graves show individuals in a variety of positions, supine, sitting, extended, flexed and more. One individual was buried on his stomach. Grave goods and food accompany a number of the burials. Both position in the grave and the type of grave goods appear to vary with the age and sex of the individual.

A number of graves and cemeteries are now known from northern Europe, including the site of Nederst in Jutland. Finds of one or a few graves at excavations in the early part of this century may well represent the remains of larger cemeteries. A number of interesting burials have been reported from underwater sites in the Baltic. The recent excavation of a mass grave at Stroby Egede in Zealand with eight children and adults (four male/four females) is also of interest (Brinch Petersen 1990).

The cemeteries provide a wide variety of information on the biology and culture of Mesolithic peoples. Skeletons are generally robust with little indication of disease or malnutrition. Violent trauma, however, is not uncommon and a number of the individuals appear to have been victims of murder. Such evidence suggests that inter-group conflict may have been frequent in this area. Large cemeteries, usually located within settlement areas, reinforce the notion of substantial, sedentary communities in the Mesolithic.

Styles and Territories

The distribution of specific raw materials, types of artefacts, and styles of manufacture or decoration change dramatically from the Late Paleolithic through the Mesolithic of northern Europe. These changes reflect (1) a general decrease in the size of such distributions, and (2) the appearance of nested, or hierarchical, patterns. If we assume that these patterns reflect aspects of human social organization, it may be possible to investigate questions such as the size and nature of local and regional social groups and interaction spheres within northern Europe.

There were at least three distinct areas or "techno-complexes" in the Late Paleolithic of the north European plain and southern Scandinavia at the end of the Pleistocene

(Clark 1975, Schild 1984). The Ahrensburgian, Swiderian, and Brommian culture cover areas of more than 100,000 sq km. The distinctions among these three groups are most apparent in the forms of projectile points, in assemblage composition, and in types of raw material.

In the Boreal period of the early postglacial, there are as many as eight to ten distinct Mesolithic groups on the North European Plain. By the Atlantic period, after 8000 B.P., this pattern has been amplified to the point where fifteen or more distinct groups can be recognized (Price 1981). Examination of the distribution of bone and antler points as indicators of social territories in the late Paleolithic and Mesolithic of northwestern Europe has confirmed these patterns (Verhart 1990). Verhart reports a change in such style zones from an average size in the late Paleolithic of 230,000 sq km to 80,000 sq km in the middle of the Mesolithic, to 30,000 sq km by the late Mesolithic.

In southern Scandinavia, there are a variety of artefacts, materials, and designs with restricted distributions, particularly during the latter part of the Mesolithic. Significant regional variation in artefact types and styles is documented from the later half of the Ertebolle; differences between eastern and western Denmark, and among smaller areas within Zealand have been reported (Andersen 1980). Ground-stone Limhamn axes occur largely on Zealand and in Scania (Becker 1939), T-shaped antler axes and bone combs and rings are found primarily in Jutland (Andersen 1973). Certain design elements on pottery also show restricted distributions (Andersen 1980). Analysis of flaked flint axes from Zealand (Vang Petersen 1984) has indicated that certain types are distinctive of the northeast corner of the island, covering areas with a diameter on the order of 40 km or less.

The shift from larger areas on the order of 100,000 sq km to areas of 1000 sq km or even smaller is an important indication of the increasing density and definition of human groups in this period. It is equally significant to note that these "distributions" or "style zones"; are often found nested within larger scales of patterning. The shapes of axes in Zealand, for example, fall within the larger distribution of distinctive materials found in the eastern part of southern Scandinavia. The remains from the coastal areas of southern Scandinavia are distinct from those of the inland area of the North European Plain, yet all are included within an area defined by the use of trapezoidal projectile points.

The evidence from the distribution of various artefacts and materials in northern Europe suggests that distinctive "zones" marked by certain types and designs are becoming smaller and more pronounced through the Mesolithic. While it is not yet clear what such zones mean in terms of human social organization, a general pattern of a reduction in territory seems apparent.

Exchange

While the evidence from the distribution of artefacts and designs indicates a reduction in area, information from the exchange of various materials and items indicates interaction among these groups. Exchange is indicated by the distribution of certain raw materials or the presence of exotic artefacts. A wide range of exotic items are known from the late Mesolithic. Although elk and aurochs were locally extirpated (Aaris-Sorensen 1980), tooth pendants from these species were found in the cemetery at Vedbaek. An ornamented club of elk antler was found at a nearby site. These items probably came from either Sweden or the European mainland.

Other materials and artefacts document contact with Neolithic groups located only a hundred or so kilometres to the south in northern Germany and Poland. Danubian farming groups occupied parts of northwestern Europe, including central Germany, southern Holland, and south-central Poland, by 6500 B.P. The pottery found in the late Mesolithic of northern Europe is one of the best examples of contact between these farmers and foragers. A number of other "Neolithic" items are also borrowed and appear in a Mesolithic context, including t-shaped antler axes and bone rings and combs. The presence of central European Neolithic *Schuhleistenkeil* (shaft-hole axes) in the late Mesolithic of Denmark and southern Sweden is also indicative of contact (Fischer 1982). These axes are made of amphibolite, a type of stone found only in southern Poland. The majority of such axes in a Mesolithic context are found in the eastern Danish islands, suggesting contact across the Baltic. While it is unclear what objects are being exchanged with Neolithic groups, furs and amber are very good candidates.

Conclusions

In the final analysis it appears that the societies of the last hunters (and gatherers and fishers) of northern Europe evolved quickly towards increasing complexity in the period prior to the spread of agriculture (Price 1985). Complexity is defined by greater diversity (more things) and integration (more connections). Advances in technology, settlement, and subsistence are better preserved in the archaeological record. Technology developed towards greater efficiency in transport, in tools, and in food procurement. Settlements were generally larger, of longer duration, and more differentiated than in the preceding Paleolithic. Food procurement was both more specialized and more diversified — specialized in terms of the technology and organization of foraging activities and diversified in terms of the numbers and kinds of species and habitats that were exploited.

At the beginning of the essay, I suggested that the archaeological evidence from the Mesolithic of northern Europe indicated that some common assumptions in archaeology are likely to be incorrect, specifically (1) that the Mesolithic was a period of "cultural degeneration", and

(2) that foragers in the past typically lived in small, mobile groups. I will now elaborate on these two points.

The Meaning of Mesolithic

The term Mesolithic was originally applied as a “residual” category or “catch-all” to describe those archaeological remains found between the end of the Paleolithic and the beginning of the Neolithic. The contrast between the richly painted caves and beautifully carved tools of the Upper Paleolithic and the “impoverished” scatters of small, stone tools from the Mesolithic of France led to an impression of degeneration, of cultural regression, that would only be relieved by the arrival of enlightened, pottery-making, farming villagers in the Neolithic.

This rather negative view of the Mesolithic is largely the result of factors of preservation. Very different kinds of evidence were used to compare the Upper Paleolithic, Mesolithic and Neolithic time periods. The cave paintings and decorated bone and antler tools of the Upper Paleolithic, and the pots and ground stone axes of the Neolithic, were compared with the microlithic stone artefacts of the Mesolithic. It is important to note that different classes of material were being considered. In most areas of western Europe, there were few preserved examples of bone or antler items found at Mesolithic sites. The simple painted pebbles of the Azilian were taken as the typical examples of Mesolithic art and contrasted with the painted caves of the Perigord. Much better evidence of Mesolithic art, however, can be found in northern Europe where conditions have preserved examples of carved amber figurines, engraved wooden objects, and numerous decorated bone and antler pieces (Clark 1975).

Since its initial recognition, the concept of Mesolithic has been saddled with a number of other connotations. For example, the Mesolithic has been defined by the absence of ground stone tools and pottery, but both are present during the latter part of the period. Pottery is known from the Ertebølle in northern Europe, but also from France, Holland, and elsewhere in the late Mesolithic. Ground stone tools in the form of axes and/or maceheads make their appearance throughout northern and western Europe during the Mesolithic.

Recent investigations of this period, before farming, have changed current archaeological perspectives on the Mesolithic. Indeed, the argument today has come almost full circle with some contemporary scholars portraying the period as one of the most dynamic and critical in the evolution of human culture (Clark 1980). Suffice it to say that the Mesolithic can no longer be viewed as a period of degeneration or decline. The evidence from the north and elsewhere in Europe (Price 1987, 1991) documents a time of innovation, interaction, and successful adaptation among these early postglacial foragers.

Foraging Adaptations

A second point to be made concerns the preconceptions that archaeologists bring to their study of the past. Most models for prehistoric hunter-gatherer societies are based on evidence from the recent foragers of the ethnographic record who inhabited the most marginal environments on the planet. Although there are a number of ethnographic reports of contemporary hunter-gatherers, one volume — *Man the Hunter* — has probably had the most impact on archaeological thinking. Studies of a number of living hunter-gatherer groups were brought together in the published proceedings of this important anthropological conference. The general conclusions of the conference, as summarized by the organizers, were that hunter-gatherers lived in small groups and moved around a lot (Lee and DeVore 1968). Over the last twenty years, this limited perspective has essentially become doctrine and almost totally dominated archaeological interpretations of past hunter-gather adaptations. There has been heated resistance to discussions of more complex hunter-gatherer groups in many areas, in spite of rather compelling evidence. Archaeologists tend to see hunter-gatherer groups as small, mobile, and simple rather than large, sedentary, and complex.

The evidence from the Mesolithic of northern Europe, and elsewhere, demonstrates that many of the foraging groups of the early postglacial do not fit the small and mobile mould. The evidence from northern Europe is not atypical of foragers, but rather may be one of our best examples for late Pleistocene and Holocene adaptations. The majority of existing evidence for such groups comes largely from inland areas where population density would have been low and mobility perhaps more pronounced. We have very little evidence in most areas for the coastal aspect of these adaptations. It is critical to remember that the rising sea levels of the Holocene have submerged the early postglacial coastlines of much of the globe. It is now clear that sea levels in the Atlantic and Mediterranean did not stabilize at modern shorelines until late in the postglacial, perhaps 2500 B.P. (Ters 1976). The postglacial coastlines of most of Europe — and the other continents — are simply missing from the archaeological record. They lie underwater. Northern Europe is atypical only in the fact that these old coastlines have been uplifted by the eustatic rise of the land and are today accessible to archaeologists.

Thus, the evidence from northern Europe is quite typical of foraging adaptations along the coasts of Europe — and elsewhere — during the early postglacial. Large, sedentary communities with significant territoriality, networks of exchange, and patterns of interaction may well be typical of many foraging adaptations. Complex hunter-gatherer adaptations are likely to be the rule, rather than the exception, in many areas of the later Pleistocene and Holocene (Price and Brown 1985). The sooner archaeologists begin to look for such societies, the sooner we will begin to

better understand the forager societies of the past.

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Addendum

In my report on the XIV Congress of the Indo-Pacific Prehistory Association held at Yogyakarta, Indonesia from August 25 to September 2, 1990, published in *Man and Environment* XVI (1): 119-121, I had inadvertently omitted mention of Dr. B.S. Karir's participation in the above Congress. Dr. Karir presented a paper entitled *Core Technology at Nangal in the Sutlej Valley, NW India* in the session on *Studies in the Pleistocene of India*.

R.K. Ganjoo

Ancestry of *Bos* species: Myth and Reality III. Biostatistical Considerations

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Abstract

The metrical data available on Pleistocene and Recent bovine bones were examined using bivariate and multivariate statistical methods. Bivariate analysis indicated that the Pleistocene bones are statistically indistinguishable from the Recent forms. Principal component analysis showed that the Pleistocene specimens are generally larger, but with respect to shape are not different from the Recent ones.

Introduction

As discussed earlier (Joglekar and Thomas 1990 a and b) when morphological traits are not as useful as taxonomic characters, then the problem can be attacked with biostatistical tools. The present paper deals with the use of certain statistical methods applied to resolve the problem of bovine ancestry.

For most of the statistical methods, adequate sample size is a prerequisite. However, sample size is the critical constraint in palaeontology. The lacuna of inadequate sample size can be compensated for, if the power of the test is increased by imposing more stringent conditions for testing the hypothesis. In this investigation, generally the tests are done at 1% level of significance in order to increase the validity of the inferences.

Materials and Methods

The Pleistocene and Recent material under examination is compared using two types of methods, i.e. bivariate and multivariate. The test procedures are after Snedecor and Cochran (1967).

The present study includes re-analysis of already published data by Pilgrim (1939) and Kumar (1984). Mainly cranial measurements were used from both the studies.

The astragalus, which is one of the tarsal bones, was selected as the most important post-cranial bone for statistical comparisons. The choice of the astragalus is justified by its numerous characteristics. The absence of complete bones is a really serious problem in palaeontology and also in archaeozoology. It has been noticed that the astragalus is, in many cases, the frequently occurring bone and generally in a well preserved condition. The completeness of this bone

Table 1: Sources of the measurements of astragalus

Species	Approx. age	Locality	Reference
<i>B. namadicus</i>	26820 y B.P.	Manjra	Sathe (1990)
<i>B. namadicus</i>	31750 y B.P.	Naramda	Salahuddin (1987)
<i>Bos</i> sp.	24670 y B.P.	Pravara	Tripathi (1967)
<i>Bos</i> sp.	4000 y B.P.	Langhnaj	Clutton-Brock (1965)
<i>Bos indicus</i>	4000 y B.P.	Kaothe	Thomas & Joglekar (1990)
<i>Bos acutifrons</i>	1.8 million years	Upper Siwaliks	Ganjoo (1989)

justifies its selection, because, especially in the multivariate statistical methods, completeness of the data matrix is required. The sample of astragali was measured using the standard method described by von den Dreisch (1976). The sources of the bone measurements are given in Table 1.

It must be mentioned that the species identification is based on the independent investigations of Pilgrim (1939) and Kumar (1984) and the same is continued in further analysis. The measurements taken on the astragali found at Kaothe (Chalcolithic site in District Dhule, Maharashtra) are as yet unpublished.

Comparison of Astragalus Measurements

The cattle remains described by Clutton-Brock (1965) as *Bos* sp. were compared with other cattle astragali. In total three types of comparisons were done:-

1. Langhnaj (LGH) compared with Kaothe (KTE)
2. Langhnaj (LGH) compared with the Manjra Valley specimen
2. Langhnaj (LGH) compared with the Upper Siwalik specimen

1. *LGH-KTE Comparison:* The LGH astragali were compared with the KTE astragali using a two sample 't' test (Table 2). The test indicates that LGH cattle in general are larger in size. The LGH astragali are not statistically different from the KTE astragali with respect to lateral length, but were significantly wider than the KTE astragali. This result indicates that LGH cattle did not differ in height at the withers (since the length of astragalus can be converted to height at the withers), but were more robust in size than the KTE cattle.

Table 2: Results of Two Sample 't' test

Measurement	Mean difference	t	significance
Lateral length	+ 8.4999 mm	1.86	not significant
Distal width	+ 8.0048 mm	3.47	at 1 % level

Mean difference obtained between LGH (n1=5) and KTE (n2=46)

Kaothe and Langhnaj are situated not far from each other and chronologically too, co-existence of two different forms in Western India is interesting. The Langhnaj cattle were also tested with other known forms using a single sample test (Table 3).

The results of the above test indicate that, since approximately 1.8 million years (date of the Siwalik specimen after Ganjoo, 1989), cattle are statistically indistinguishable from those living around 2000 B.C. in the Chalcolithic-Mesolithic cultural context. At the same time a robust form existed along with the slender domestic form. Certain doubts were raised about the identification of the species of *Bos* found at Langhnaj. Clutton-Brock (1965) herself preferred to call it *Bos* sp., but pointed out the possibility of the existence of *Bos namadicus*. The metrical data confirms the possibility that the cattle at Langhnaj could have been *Bos namadicus*, which was sizewise comparable to the Pleistocene specimens and was more robust than contemporary domestic cattle.

Multivariate Analysis of Bovine Crania

Several cranial measurements were considered by Kumar (1984) to understand differences between Pleistocene and Recent specimens. In his study it has been established, by

Table 3: Results of Single Sample 't' test

Measurement	Mean difference	t	Significance at 1% level
LGH-Manjra fossil @			
Lateral length	-4.5373 mm	-1.89	not significant
Distal width	-0.8700 mm	-0.52	not significant
LGH-Nevasa fossil @			
Lateral length	-4.7371 mm	-1.99	not significant
Distal width	-0.6748 mm	-0.41	not significant
LGH-Siwalik fossil \$			
Lateral length	4.5373 mm	-1.89	not significant
Distal width	-3.8700 mm	-2.33	not significant

@: *Bos namadicus*/Bos sp. \$: *Bos acutifrons*

two sample tests, that the Pleistocene crania are statistically not distinguishable from the Recent specimens. Here the same data were re-analysed using 9 cranial variables. viz. maxilla breadth at M1, maxilla breadth at M2, maxilla breadth at M3, maxilla breadth at maxillary tuberosity, total length of upper cheek teeth row, length of upper molar row, length of upper premolar row, breadth of palate at M3 and maximum breadth of palate. The choice of these variables is limited by the availability of the individual measurements in the case of all the forms. Five Pleistocene crania (P1,P2,...) were analysed by the multivariate technique along with five Recent crania (R1,R2,...). The technique of Principal Component Analysis(PCA) was used as described by Anderson (1972) using the appropriate Computer Programme (the programme was kindly supplied by Mr. S.S. Bedekar of the National Institute of Virology, Pune and was modified by the senior author).

The first two principal components were extracted and called PC I and PC II. The results of PCA are given in Table 4. The first two PCs were plotted according to the method described by Balkrishnan (1988) as a two dimensional plot (Fig.1). The PCA method has several advantages over the conventional univariate methods. This method does not require outside information other than the variables and none of the variables is given *a priori* importance. All the given variables are treated *at par* while obtaining information from the variables and a set of new variables is created. These dummy variables are constructed by considering a number of equations from what is called covariance matrix. An example of the covariance matrix in the form of correlation coefficients is given in Table 5.

Table 4: Results of PCA Carried Out on *Bos* Crania

Cranium	PC I	PC II	Species
P1	+2.3176	-0.8470	<i>Bos namadicus</i>
P2	+2.6507	-0.7031	<i>Bos</i> sp.
P3	-0.8710	-1.8474	<i>Bos</i> sp.
P4	+0.4905	-1.3873	<i>Bos</i> sp.
P5	+2.6507	-0.7031	<i>Bos</i> sp.
R1	-3.1839	-1.4056	<i>Bos indicus</i>
R2	-2.0007	+0.0112	<i>Bos indicus</i>
R3	-3.4130	+1.6782	<i>Bos indicus</i>
R4	+0.5554	+1.7792	<i>Bos indicus</i>
R5	-0.7994	+1.6524	<i>Bos indicus</i>

Table 5: Correlation Matrix for Nine Cranial Variables

	1	2	3	4	5	6	7	8	9
1	-								
2	.22	-							
3	.34	.92	-						
4	.42	.74	.70	-					
5	.52	.42	.60	.28	-				
6	.57	.53	.69	.33	.97	-			
7	.45	.27	.50	.05	.92	.91	-		
8	.42	.92	.84	.66	.48	.61	.27	-	
9	.39	.93	.89	.62	.59	.70	.50	.30	-

Biometrical data in the case of biological systems, has revealed the significance of the first two principal components. Wright (1954) has used metrical data on bones of fowl to extract the first two principal components for the identification of various forms. Jolicoeur and Mosiman (1960) have classified turtle carapaces using the PCA. They have identified the first two principal components as estimates of size and shape respectively. The concept of the size and shape of skeletal elements has been used in the case of archaeological samples of Amerindian dogs by Brothwell *et al.* (1979) and in the case of pithecooid phylogeny by Boyce (1969).

The same logic of size and shape estimates using the first two PCs can be applied to cattle craniology. The two dimensional plot of PC I against PC II (Fig. 1) indicates that Pleistocene crania cannot be clearly distinguished from Recent crania. If we assume that *Bos indicus* and *Bos namadicus* are in fact two distinct species then it is expected that the two forms would form two clusters. There is no such cluster formation. In general, the Pleistocene forms are larger than the Recent forms, but there is no distinction with respect to shape either.

Qualitative Morphology Vs Multivariate Morphometry

The three distinct forms of ancient bovines in the Indian Pleistocene context (Pilgrim 1939) are *Hemibos*, *Proamphibos* and *Leptobos* identified at the generic level. The measurements available on the respective cranial material were used in this study for multivariate analysis. Table 6 gives details of the principal component analysis done with 7 cranial variables. The variables used in this study were length of temporal fossa, breadth of the brain case, breadth of the skull at orbits, width of the skull at mastoid, height of the occipital, breadth of the face at M 3 and height of the face at M3.

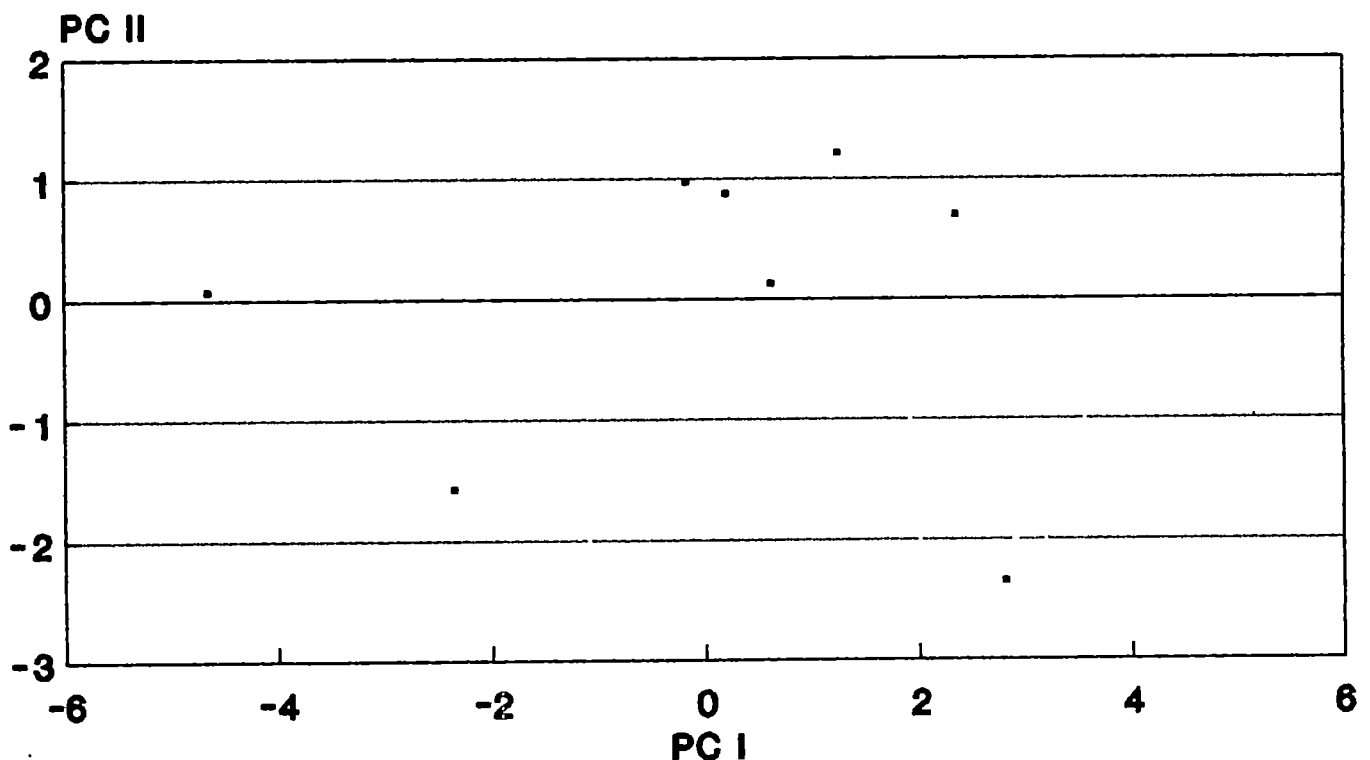


Fig. 1: PCA carried out for Bovine crania

Table 6: Results of PCA Performed on Bovine Crania

Cranium	PC I	PC II	Species
A	+1.2403	+1.2100	<i>Hemibos</i>
B	+2.3423	+0.6885	<i>Hemibos</i>
C	+0.1948	+0.8698	<i>Hemibos</i>
D	+0.6134	+0.1246	<i>Proamphibos</i>
E	-0.1759	+0.9683	<i>Proamphibos</i>
F	-4.6625	+0.0661	<i>Leptobos</i>
G	+2.8034	-2.3516	<i>Leptobos</i>
H	-2.3559	-1.5755	<i>Leptobos</i>

The two dimensional plot of PC I against PC II (Fig. 2) reveals that *Leptobos* specimens are different from the others, but they do not form a single cluster. Although *Proamphibos* and *Hemibos* are expected to fall apart, they form a single cluster. Thus multivariate analysis points to the possibility of a single unit for *Hemibos* and *Proamphibos*, while they are supposed to be distinct stems of the bovine phylogeny. If as suggested by qualitative morphology (Pilgrim 1939), the three forms are distinct generic stocks, then PCA is expected to group them into three clusters. The absence of such clusters indicates that the present grouping is not adequate and needs revision based on quantitative

morphology. This example of the Pleistocene forms is used to throw light on an alternative classification scheme to those currently used in bovine palaeontology.

Multivariate analysis of the type described above could not be performed on *Bos namadicus* along with other Pleistocene forms because such comparable data is not available. *Bos namadicus* skulls therefore were compared with other forms studying three variables by simple bivariate 't' tests. Results of the tests are summarised in Table 7.

Conclusions

Metrical considerations of the bones of ancient bovines indicate that it is not possible to separate the so-called closely related species. Such a situation is not difficult to explain at the level of population genetics, where the ancient animal populations must be considered as a continuum of a gene pool changing over time. A fundamental change at the theoretical level is necessary to examine paleontological data relating to a modern synthesis of biological evolution.

Both bivariate and multivariate morphometry of ancient bovines indicates that by themselves qualitative markers of species distinction are insufficient to understand the phylogenetic relationships among closely related genera. The results also indicate that the forms grouped earlier may not be the same (if the assumption of correct identification is refuted) or alternatively the forms were so close genetically that size-shape polymorphism was as yet not manifested.

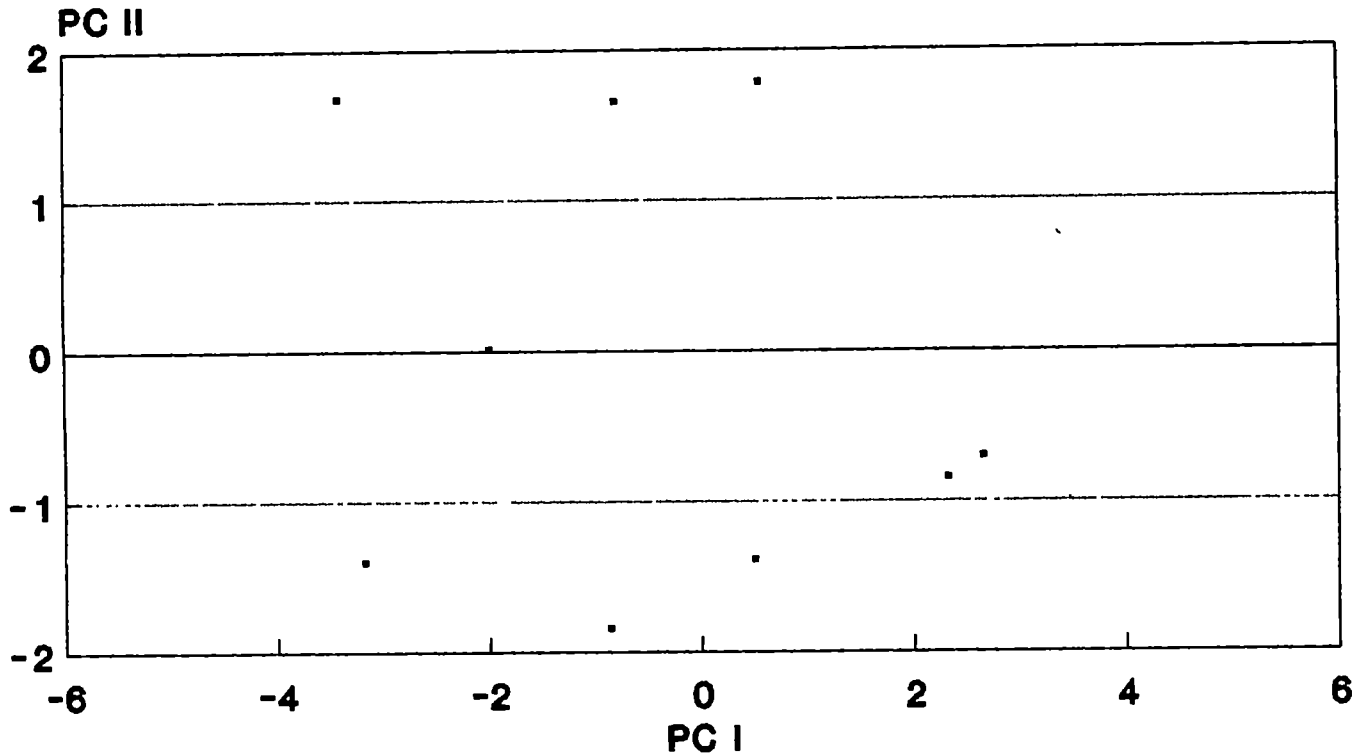
Fig. 2: PCA carried out for *Bos* crania

Table 7: Matrix of 't' tests for Three Cranial Variables

Cranial Breadth at Orbit				
	<i>Leptobos</i>	<i>Hemibos</i>	<i>Proamphibos</i>	<i>B. namadicus</i>
<i>Leptobos</i>	—	NS	NS	NS
<i>Hemibos</i>		—	NS	NS
<i>Proamphibos</i>			—	NS
<i>B. namadicus</i>				—
Cranial Breadth at Mastoid				
<i>Leptobos</i>	—	NS	NS	NS
<i>Hemibos</i>		—	NS	NS
<i>Proamphibos</i>			—	**
<i>B. namadicus</i>				—
Breadth of Face at M 3				
<i>Leptobos</i>	—	NS	NS	NS
<i>Hemibos</i>		—	NS	NS
<i>Proamphibos</i>			—	NS
<i>B. namadicus</i>				—

** significant at 1% level. NS not significant

The bones of *Bos* sp. identified at Langhnaj have to be treated separately eliminating the bias for so-called extinction of *Bos namadicus* before the early Holocene period. At present it is not possible to comment on whether the large sized cattle at Langhnaj were definitely *Bos namadicus*. Most likely it was another form of cattle existing along with the early domestic cattle in Western India and possibly remaining in a wild state. The possibility of the existence of wild cattle in India as late as 2000 B.C., (may be in isolated and rare condition) is interesting since the origin of Indian domestic cattle is supposed to be the outcome of the autochthonous domestication of Indian wild aurochs i.e. of *Bos primigenius namadicus*.

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Archaeological Wood Remains from the Prehistoric Cave Site at Betamcherla (Muchchatla Chintamanu Gavi), District Kurnool, Andhra Pradesh

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Abstract

This paper reports the results of an anatomical study on the wood remains of two species, *Cassia cf fistula* Linn. and *Acacia cf chundra* Willd. recovered from the early Holocene deposits at Mesolithic Betamcherla (Muchchatla Chintamanu Gavi), District Kurnool, Andhra Pradesh.

Introduction

The cave site at Betamcherla (Muchchatla Chintamanu Gavi) (15°25'N: 78°08'E) in the Kurnool district of Andhra Pradesh, lies about 60 km south of the district headquarters (Fig. 1). This site was excavated by M.L.K. Murty in 1971 and 1972 (Murty 1974). The excavations yielded remains of Upper Palaeolithic and Mesolithic cultures ranging in age from the late Pleistocene to the late Holocene, c. 20,000 to 2,000 B.P. (Nambi and Murty 1983). A detailed account of the stratigraphy, lithic remains, bone artefacts, fauna and the palaeoenvironment have been reported elsewhere (Murty 1974). Murty and Kajale visited the site in June 1978 and excavated a fresh trench from which were recovered the wood remains reported here.

All the wood remains studied in this paper belong to the early Holocene period and, on the basis of cultural remains, may be dated between 10,000 and 5,000 years B.P.

Materials and Methods

The materials studied consist of small uncarbonised and deteriorated wood pieces. Sample no. 1 contained 3 irregular pieces while sample no. 2 appeared to be from a knotty portion of the tree. Sample no. 1 was collected from trench B, layer (2), occurring at a depth of 20 to 40 cm whereas Sample no. 2 was retrieved from trench F at a depth of 20 to 40 cm. Both the samples belong to the Mesolithic culture, assignable to the early Holocene period on the basis of stratigraphic and archaeological considerations. Small blocks made from these samples were boiled in water for about four hours and 15 to 18 micron thick sections (cross, radial and tangential) were cut on a Reichert Sliding

Microtome. The sections were stained in Heidnhein's haematoxylin and safranin and mounted in canada balsam. The holotypes and a set of slides are maintained at the Wood Anatomy Section of the Forest Research Institute, Dehra Dun.

Results

All the samples are dark brown in colour, hard to very hard and medium coarse in texture.

Sample No. 1: All the pieces in this sample were found to belong to the same species.

Anatomical Structure of the Wood: A diffuse porous wood. Growth rings delimited by a more or less continuous line of parenchyma. Vessels small to medium in diameter (90-180 u), solitary or in radial multiples of 2-3, perforation simple, intervessel pit orbicular to oval, mostly 8 u in diameter, occasionally upto 12 u, often coalesced, vested; vessel-ray pitting similar to intervessel pits, occasionally plugged with yellowish-brown gummy deposits. Parenchyma abundant, predominantly paratracheal in thick aliform confluent bands, occasionally also aliform with fairly long extensions and also in a uniseriate more or less continuous line delimiting growth rings, strand of four cells, occasionally subdivided into chambered crystalliferous strands, each locule containing a rhomboidal crystal. Rays 1-2 seriate rarely 3 seriate, homogenous, width upto 40 u and height 7-30 cells or 450 u, crystals not present. Fibres somewhat angular in cross section, libriform, interfibre pitting rather sparse.

Diagnosis: *Cassia* sp. probably *Cassia fistula* Linn. (comparable with *Cassia fistula* from Andhra Pradesh, DDW slide no. 7442).

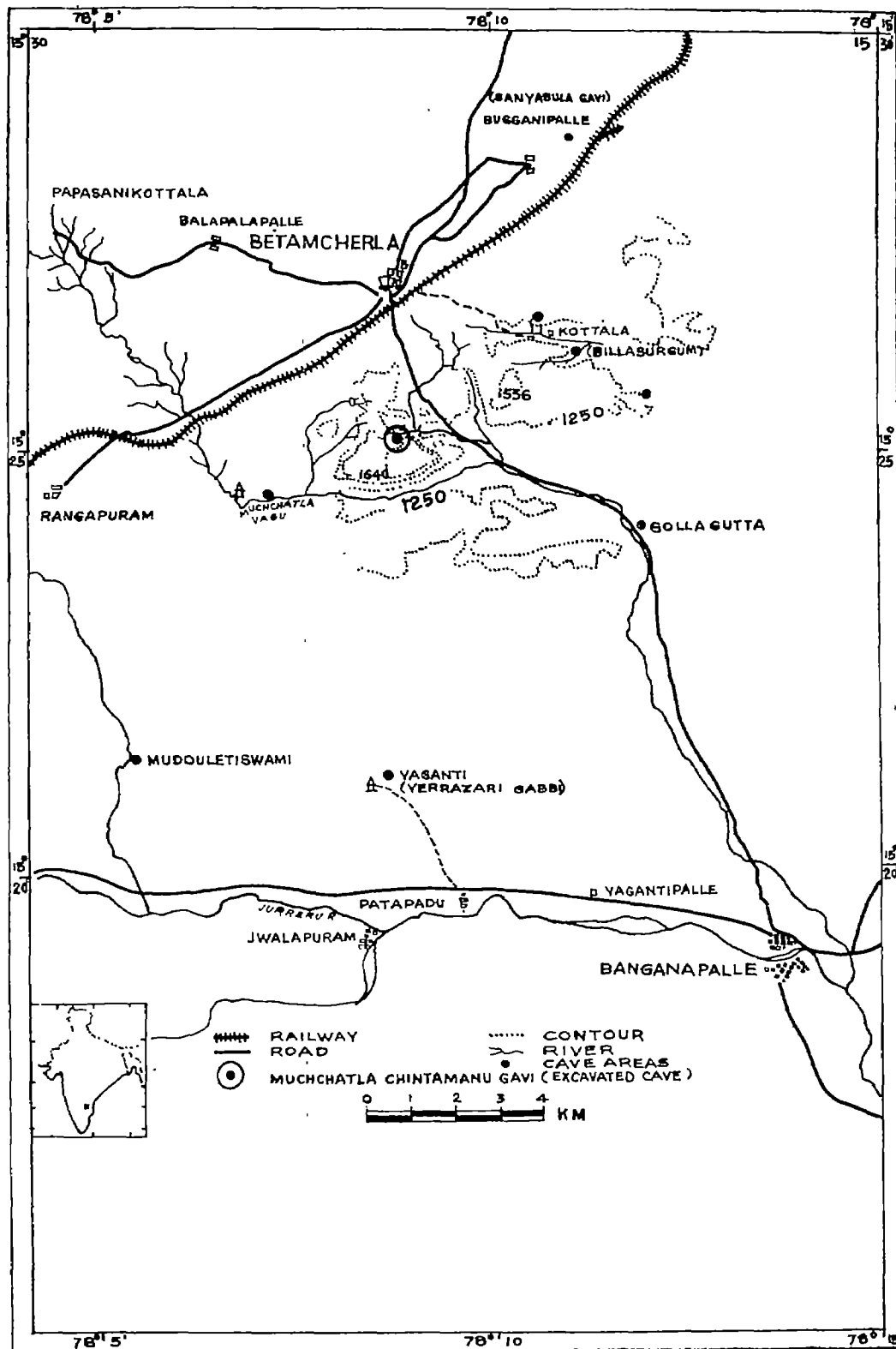


Fig. 1: Map showing the Cave areas around Betamcherla (after Murty 1974)

Sample No. 2: One piece of wood

Anatomical Structure of the Wood: A diffuse porous wood.
Growth rings delimited by a fine interrupted line of paren-

chyma. Vessels small to medium in diameter (75-140 μ); solitary and in short radial multiples of 2-3, perforation simple, intervessel pits, 7-8 μ in diameter, orbicular to oval

in shape, vested; vessel-ray pitting similar to intervessel pits; occasionally filled with dark gummy substance. Parenchyma predominantly paratracheal, vasicentric to aliform, sometimes connecting or enclosing adjacent vessels in oblique or tangential manner, strands of 2-4 cells, each containing a solitary rhomboidal crystal, gummy infiltration is possible. Rays homogenous mostly 3-4 seriate, rarely 5 seriate and 13-65 u in width, and upto 35 cells or 550 u in height; crystals absent. Fibres mostly angular in cross section, non-septate, interfibre pits simple, rather sparse.

Diagnosis: *Acacia* sp. probably *Acacia chundra* Willd. (comparable with *Acacia chundra* from Karnataka, DDW slide no. 7720).

It is of interest to note that both these timbers occur in South India. Gamble (1935) states that *Cassia fistula* Linn. occurs in all districts of Andhra Pradesh and *Acacia chundra* Willd. is found "from the Kistna southwards to Cape Comarin, but is most common in the Ceded Districts".

General Discussion and Cultural Interpretations

In India, wood remains from archaeological sites are generally reported from protohistoric and early Historic levels and records of wood from earlier cultural periods are rare. It is against this background that the occurrence of *Cassia* cf *fistula* and *Acacia* cf *chundra* of early Holocene age assumes some importance, as they are reported from a Mesolithic context in South India. The only palaeolithic evidence of wood is that of a semicarbonised piece of *Terminalia* sp. which was discovered from the Mula-Dam site in Maharashtra (Rajaguru 1970) and dates back to c. 33,000 B.P. Kajale and Rajaguru (1989) have reported a piece of semicarbonised wood from a buried channel at Nirgudsar, also in Maharashtra dating to about 38,000 B.P. and loosely associated with Middle Palaeolithic cultural materials scattered around Nirgudsar. Since this date falls in the uppermost limit of age determinations by radiocarbon assay, it is not impossible that the wood remains may even be older than the date obtained by ^{14}C determinations.

Gamble (1922: 272) states "... *Acacia catechu* Willd. Syn. *Acacia chundra* Willd. is common in most parts of India and Burma, extending into the Sub-Himalayan tract, westwards to the Indus and ascending to about 1000 m in the valleys... and dry regions of Ceylon where it is scarce. In Burma, it reaches north latitude 23°5' on the Irrawady river and 23° on the Chindwin river".

The chief product of the tree is *catechu*, an important catechxhol tan. The wood provides excellent fuel and is a very good charcoal tree, being preferred in north India over all others for burning lime. Pearson and Brown (1932) remarked that it is a very valuable timber, but is prized even more for the *catch* and *kath* which it yields. The timber is used for a variety of purposes including as posts in construction, for rice pestles, oil and sugar-cane crushers, harrow

teeth, making boats, combs, stocks, wheels, carts, bedpost legs, tools and sword handles, rolling pins, hooka stems, flutes, tent pegs, etc.

It is difficult to precisely state for what purpose this wood was used at Betamcherla, since it is unlikely that being a pre-agricultural site, most of the above stated uses were known to the Mesolithic inhabitants. Since the wood was found in a completely dry and uncharred condition, it was probably not exploited as charcoal. Nevertheless, it forms an important record for establishing the antiquity of these species in this region during the mid-Holocene.

Records of *Acacia* sp. have come to light from sites like Chalcolithic Inamgaon, Daimabad (around 1000 B.C.) and Early Historic Ter in Maharashtra (Vishnu Mittre and Savithri 1975; Vishnu Mittre *et al.* 1972, IAR 1983-84, respectively). The evidence for *Cassia fistula* has come to light from the Malwa levels of Daimabad in the Ahmednagar district of Maharashtra. Against this background it is worth noting what Gamble had stated as early as 1922 that "... a piece of hard, dark redwood resembling *Acacia catechu* var *catechoides* was obtained from the excavations made at Prince's Dock, Bombay and must be of very great age..." (Indian Forester, Vol. VI: 108). Recently, charcoal of *Acacia* sp. has also been reported from Savalada and the Buff and Cream Ware phases of Chalcolithic Daimabad (1000-2000 B.C.); Chalcolithic Sonegaon, District Pune (Maharashtra); Megalithic Veerapuram, District Kurnool (Andhra Pradesh); Early Historic Singh Bhagwantpur, District Kurukshetra (Haryana); and Historical Besnagar, District Vidisha (Madhya Pradesh) (IAR 1983-84). *Acacia* sp. has also been reported from the mature Harappan levels of Rohira in the Sangrur district of Punjab (IAR 1985-86). Charcoal of *Cassia fistula* and *Acacia* sp. have been reported from Chalcolithic Kayatha, District Ujjain (Madhya Pradesh) (IAR 1983-84).

Gamble (1922: 298) states "... *Cassia fistula* is found throughout the forests of India, Burma, Ceylon, one of the most widespread of the Indian trees, ascending to 4000' in the Himalayas and extending north to the hills above Peshawar". The timber is good and durable, but of small size and apt to splinter. It is excellent for posts and good for carts, agricultural implements and rice pounders. Pearson and Brown (1932) further observed that it is good durable timber, used everywhere for home posts, rice pounders, bridge posts, wheels, stocks and shafts of carts and plough handles. It would also make excellent pick axes and axe handles, tool handles, railway keys and similar articles where strength and toughness are primary considerations. He further considered it to be a species to be encouraged and cultivated not only for valuable timber which it yields but also for the medicinal value of its pods and as an ornamental tree wherever it is found. Here again, it is difficult for us to visualise the kind of use prehistoric man might have made of the wood of *Cassia* cf *fistula*. In view of the fragmented

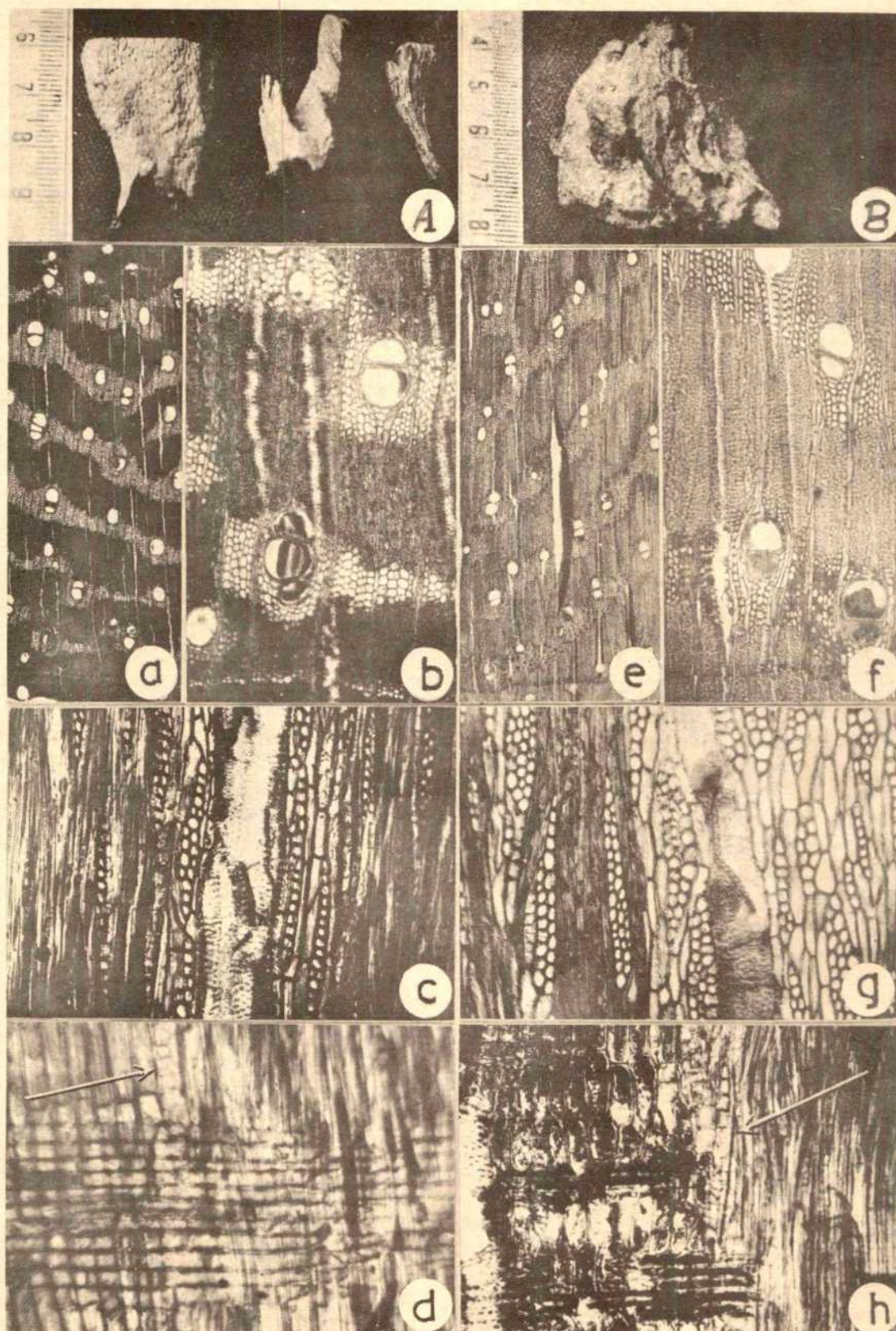


Fig. 2: (Explanation overleaf)

Explanation to Fig. 2:

A and B: Wood samples no. 1 and 2 respectively.

a to d: *Cassia* sp. probably *Cassia fistula* Linn.

- (a) Transverse section showing vessel and parenchyma distribution (x 14);
- (b) The same at higher magnification. Note the continuous line of parenchyma delimiting the growth ring (x 60);
- (c) and (d) Tangential and radial sections. Note the homogeneous rays, chambered crystalliferous strands and septet fibres (x 135).

e to h: *Acacia* sp. probably *Acacia chundra* Willd.

- (e) Transverse section showing the distribution of vessel and parenchyma (x 14);
- (f) The same at higher magnification (x 60);
- (g) and (h) Radial and tangential sections. Note the multiseriate rays and chambered crystalliferous strands (x 135).

nature of the wood pieces, it is not possible to be sure whether it was exploited for any item of prehistoric utility such as tool handles, hafting tools, etc.

In conclusion, one might like to surmise that the pre-agricultural people of Betamcherla might have been aware of at least some of the properties of the trees found in the local biota and perhaps put them to use. Such questions will, however, probably remain unanswered until we come across wooden artefacts preserved in archaeological contexts.

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Some Aspects of Quaternary Research in China: A Résumé of the Pre-Congress Training Course on Quaternary Geology Held at Peking University, Beijing, July-August 1991.

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This was the first time that INQUA had organised a pre-Congress training course for young scientists from across the globe and particularly from the Third World. I was one of the three delegates from India who had the opportunity of participating in this pre-Congress training course. The other two Indians were Dr. B.S. Kotlia and Dr. D.K. Borah from Kumaon University, Nainital and Guwahati University, Guwahati, respectively. The other members of the training course represented Czechoslovakia, U.S.S.R., South Africa, Argentina, Venezuela, Indonesia, Thailand, the Philippines, Vietnam, South Korea and Iran.

The training course was jointly conducted by the faculty of the Geography Department of Peking University and the Institute for Fundamental and Applied Quaternary Research, Vrije Universiteit, Brussel, Belgium. In addition guest lecturers participated from the Academia Sinica, the Institute of Vertebrate Palaeontology and Palaeoanthropology and the Chinese Academy of Geological Sciences. A few geologists, environmentalists and geochronologists from different laboratories in Peking University and other provinces in China, The Netherlands and Greece also took active part in the training programme. Professor Liu Tung Sheng of the Institute of Geology of the Chinese Academy of Sciences and Professor Nat Rutter, the President of the XIII INQUA were two of the distinguished speakers at the training course.

Professor Huang Runhua, the organizing secretary, introduced members to the course which was declared open by Professor Lus Huacai, the Vice-Chancellor of Peking University. Professors Wang Nailing, Liu Tung Sheng, Zhu Jingting and Zhang Zhifei made opening remarks and I was requested by the organizing secretary to speak on behalf of the members of the training course.

The opening lecture was given by Professor Liu Tung Sheng, the doyen among Chinese Quaternarists. He presented a comprehensive picture of the status of research on loess in China. Since research on loess deposits in China has top priority because they provide an ideal geologic-geomorphic sequence and since loess is also an important Quaternary formation in parts of the Indian subcontinent it may be

worthwhile to give a summary of this lecture.

The Chinese loess profiles provide a near continuous record of geological and biological environments covering the late Pliocene and the whole of the Pleistocene. This situation is considered ideal for terrestrial palaeoclimatic reconstruction and is unmatched even by deep sea sediment cores. Loess deposits cover an area of 400,000 sq km in east and central China (Fig. 1). The average thickness of the loess is 200 m, but it is also observed that in the western part of the loess territory the depth of the loess profiles goes down to about 400 m. The estimated rates of loess accumulation vary between 23 cm per thousand years in the northwest and 5-10 cm per thousand years in the southeast. In all about 37 loess-palaeosol cycles have been well defined in the stratigraphy. George Kukla and a few others have tried to identify about 45 cycles, but it appears that 37 cycles are the generally accepted number. The temporal framework of the profile places the beginning of loess deposition at about 2.4 Myr ago, at the base of the Matuyama Chron. The loess territory is geomorphologically divided into Yuan (a broad flat plateau), Liang (a narrow flat surface) and Mao (resembling a stream bed). Loess-soil stratigraphy is considered an independent measure of climatic change in the Quaternary. Loess in China is transported by wind from the inland desert of Northwest China and subsequently deposited on the Loess Plateau. At present the surface-atmospheric circulation in North China is controlled, in winter, by the dry, cold, northwesterly monsoonal air currents from Siberia and in summer, by the humid, warm southeasterly winds from the Pacific. It is therefore deduced that during the glacial period an increase in equator-pole temperature gradient would have led to an intensification of the Siberian high-pressure cell giving rise to a longer prevalence of the winter monsoon. Consequently the aridity and wind erosion in the inland deserts was intensified and increased loess accumulation took place. Conversely in the interglacial period the southeasterly summer monsoon, generated by high temperatures, carried more moisture from the ocean on to the land causing strong weathering of the loess that had accumulated during the previous glacial period, thus leading to the formation of

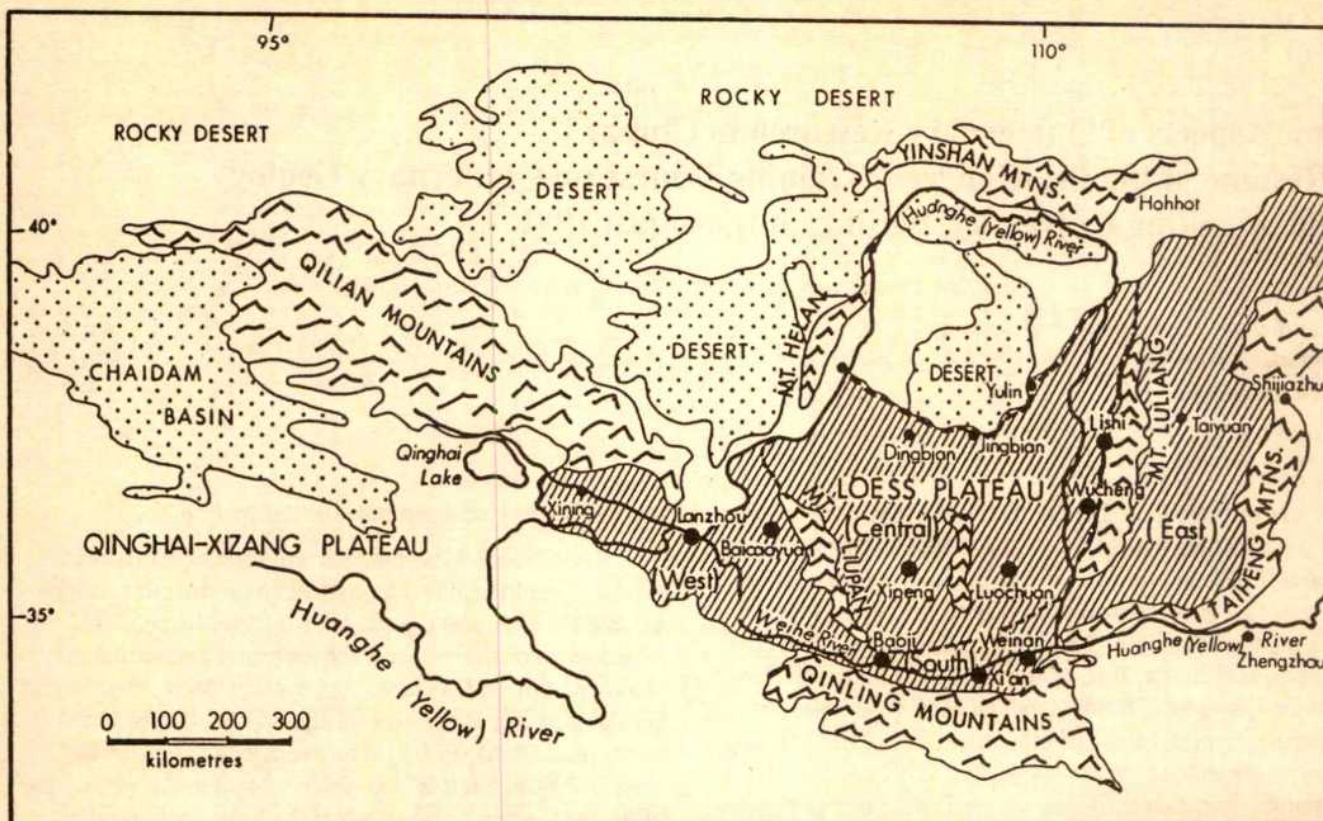


Fig. 1: Distribution of loess in China

clear soil profiles. Hence it has become possible to decipher cold-dry and warm-humid cycles in the loess profiles and also to recognise at least 37 such cycles with varying amplitudes. A variety of multidisciplinary studies have been carried out on loess and palaeosols in China (Figs. 1-3). Magnetic susceptibility studies clearly demonstrate the greater susceptibility of the palaeosols relative to the loess. Spectral power studies show 400 Kyr, 100 Kyr, 40 Kyr and 20 Kyr periodicities. It is also found that 100 Kyr periodic cycle is dominant in the Brunhes Chron, 40 Kyr cycle in the Upper Matuyama and a 100 Kyr again in the Lower Matuyama.

In addition to this Professor Liu Tung Sheng spoke on the antiquity of man in China and presented interesting evidence of *Homo erectus* from southern China dating back to 1.2 Myr ago. He also gave a brief resume of the history of the first discovery and loss of the Peking Man skull which was originally found by Dr. W.C. Pae Wenzhong in 1929. Details of the Peking Man site and its palaeoanthropology were later elaborated by Professor Zhou Mingzheng.

A field trip was arranged to the famous Zhoukoudin cave sites, situated about 50 km southwest of Beijing (Fig. 4). It is now a UNESCO World Heritage site. There are altogether 24 localities but only two groups of caves could be visited, the main Peking Man Cave site and the Upper Cave sites. Several of the earliest finds including the complete

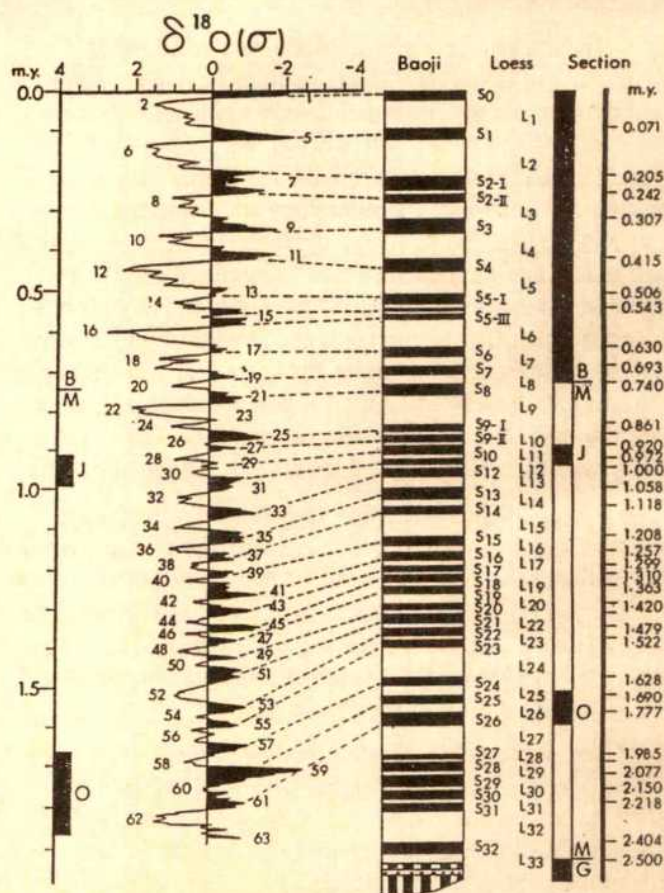


Fig. 2: Multidisciplinary studies on loess-palaeosol cycles, Baoji section along the Weine river

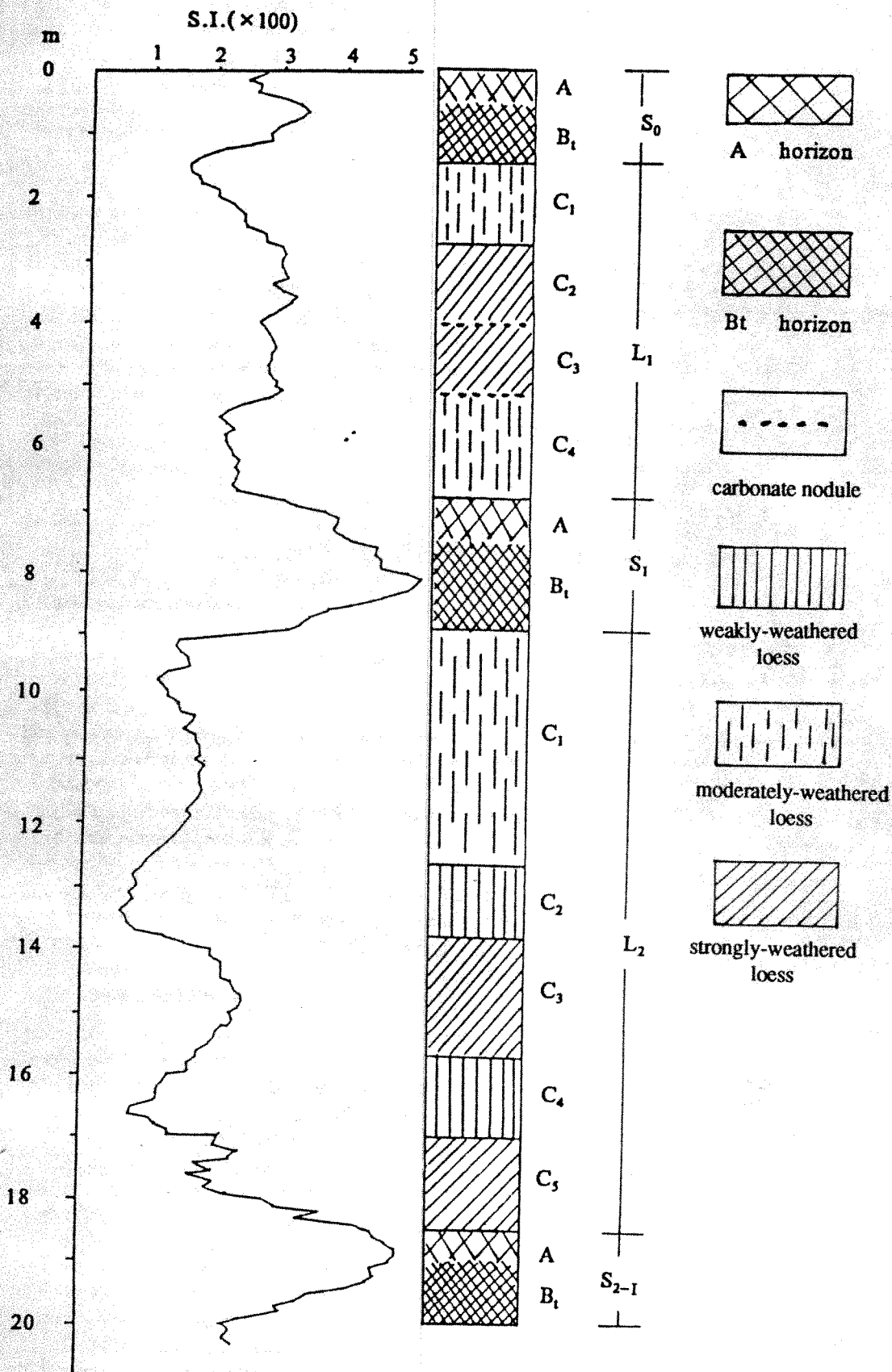


Fig. 3: Magnetic susceptibility curve above S2 in the Baoji section along the Weine river

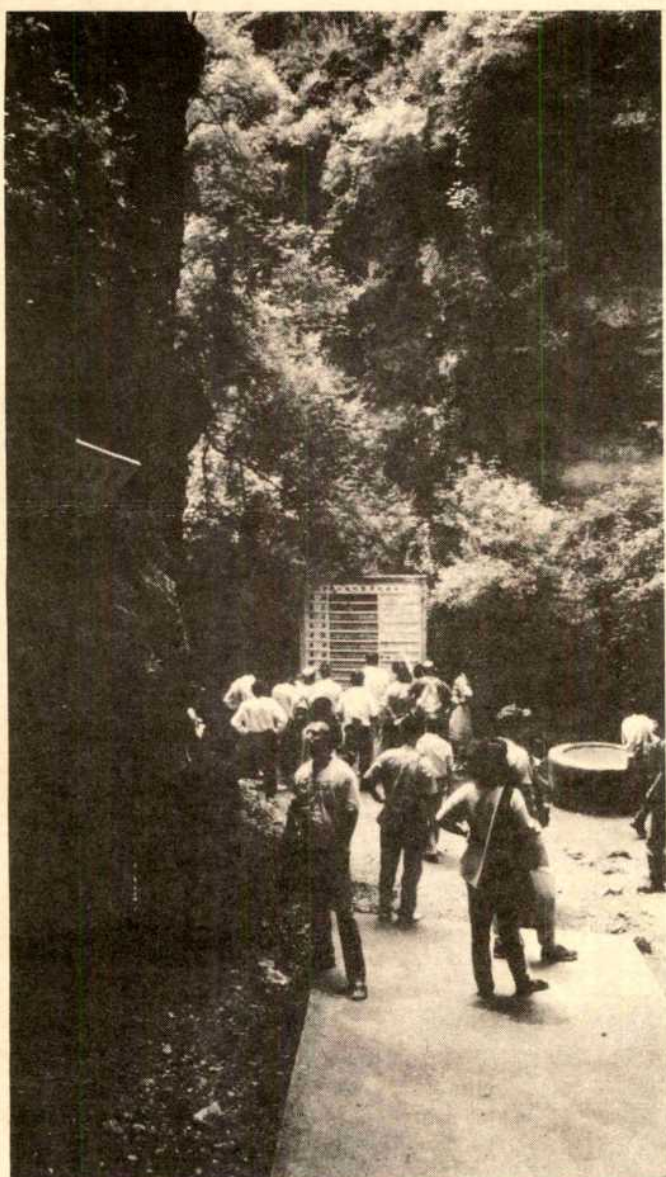


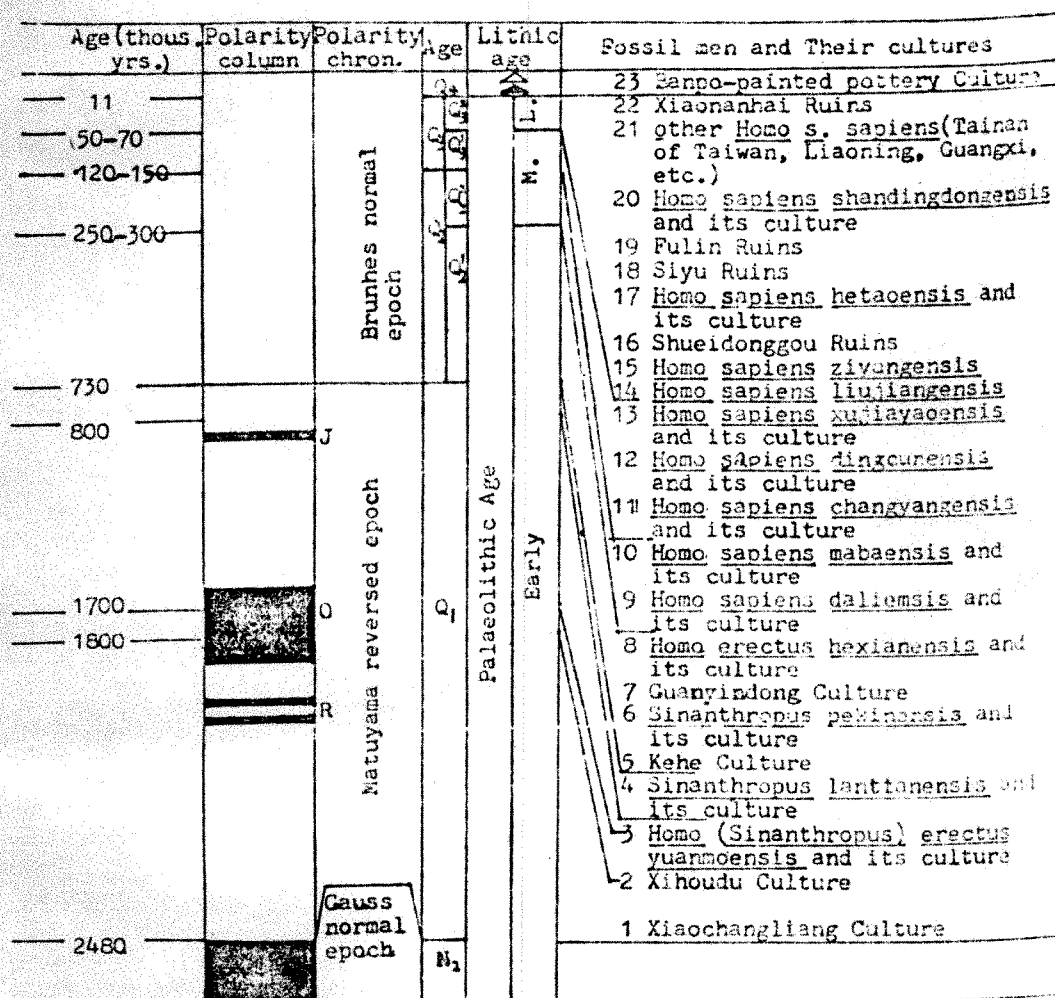
Fig. 4a: The Peking Man site at Zhoukoudin

skull from this site were lost during the Japanese occupation of China. However, discoveries made after 1949 are well preserved and only their casts are exhibited in the site museum. According to the present record there are 8 skull fragments, 6 facial bones, 15 mandibles, 153 teeth, 1 collar bone, 3 humeri and 1 wrist bone, identified as belonging to *Homo erectus pekinensis*, possessing a brain size varying from 915 ml to 1225 ml with an average of 1088 ml. The height of Peking Man is believed to have been 156 cm. The artefactual material from this complex ranges from the Lower Palaeolithic to the Upper Palaeolithic. More than 100,000 pieces of artefacts and at least 100 species of animals have been reported from this site.

Dr. Zhang Zhongu gave a detailed lecture on the compilation of a Quaternary geological map of China (Fig. 5). This map is the result of years of detailed geological,

geomorphic and scientific research on the Quaternary. Geographically China spreads into the temperate, subtropical and tropical climatic zones. The Qinghai-Tibet Plateau reaches the high altitude frigid zone and presents complex geomorphic features. While Mount Qomolangma in Tibet is the highest (8848 m ASL) mountain, the Aydingkol Lake in the Turpan Basin (Xinjiang) is as low as -154 m BSL. The eastern sea abyss goes to a depth of 6000 m. The entire continent is divisible into 4 terraces on the basis of its relief: the Qinghai-Tibet Plateau — 'the roof of the world' — 4000-5000 m ASL; the Mongolia-Xinjiang High Plain, Yunnan-Guizhou Plateau and Loess Plateau, 1000-2000 m ASL; the Eastern Low Plain, less than 200 m ASL; and the Yellow Sea, Bohai Sea, East China Sea, South China Sea and the Turpan Basin all within a depth range of -200 to -350 m BSL. These divisions present an array of geomorphic features such as denuded mountains, inland basins, glaciated valleys and submarine basins. The mountainous areas, deserts and plateaus occupy 65% of the land area. Quaternary sediments of various genetic types and of different ages are distributed all over this region. Intense neotectonism and uplifting of the Qinghai-Tibet Plateau, alternating cold and warm conditions, high magnitude transgressions and regressions of the seas and contraction and disappearance of the lakes and the formation of a 'continental outflow' type drainage system, development of deserts, active volcanism and the appearance of early man are some of the chief geological events that have occurred since the Quaternary. The Quaternary map cartographically covers the whole of China and the adjacent seas and islands, extending over 20 million sq km. It represents a systematic elaboration of abundant Quaternary geological data obtained during the past 30 years or more. It is a "full-size nine-in-one sheet to the scale of 1:2,500,000". The International Quaternary Map of the scale of 1:25,000,000 compiled by INQUA has been used as a reference map. Superimpositional expressions are used to show the superimposed distribution of rocks of different ages occurring in some very deep depositional basins. The vast variety of genetic types are classified as follows.

- (a) eluvio-deluvium: here the eluvial type is subdivided into common eluvium (el) and lateritized eluvium (ell); the eluvio-deluvium is further subdivided into eluvio-deluvium (eld1), lateritized eluvio-deluvium (eld1), frost and weathered deluvium (eld2) and karstified eluvio-deluvium (eld3). The karstified eluvio-deluvium refers to karstified laterite and this in combination with the pre-Quaternary carbonate rocks represents the distribution of karst features. The frost and weathered eluvio-deluvia are distributed at heights over 4,000 m ASL on the Qinghai-Tibet Plateau. Small round spots in different colours are added at the base to show the transitional zones between the sediments and the pre-Quaternary bedrock;



△ Neolithic Age
▲ Mesolithic Age

Fig. 4b: Fossil men of China and associated cultures

- (b) the mixed and combination genetic types are shown as abbreviations linked with a + symbol, for instance, fluvial-marine type as f+m;
- (c) the loess deposits are not subjected to classification on the basis of genetic types and they are shown as "loess accumulation types";
- (d) marine genetic types exhibit a distinct dividing line between sea and land areas. The land areas are delineated with specific colours with black codes and the sea areas are marked by lithological symbols in different colours for different genetic types;
- (e) the tectonic accumulates are basically mixed rock accumulates and are a product of N/Q plate tectonic activity. The thickness of these accumulates may reach 1000-2000 m.
- (f) The volcanic eruptive rocks are classified as andesite

(α), basalt (B) and trachyte (τ) with their ages expressed in subscripts.

The chronostratigraphy and lithostratigraphy of the Quaternary system are based on the existing geological data.

A detailed Stratigraphic Regionalization Correlation Table has been worked out and forms the cartographic basis for the compilation of the Quaternary Map of China. The upper and lower limits of the Pleistocene and of each of its epochs are as follows:

Holocene (Q4)	— 10-12 Kyr
Later Pleistocene (Q3)	— 150 Kyr
Middle Pleistocene (Q2)	— 730 Kyr
Early Pleistocene (Q1)	— 2.48 Myr
Pliocene (N2)	

Continental sediments are shown as six groups and are denoted on the map by signs, i.e. (1) gravelly soil, (2) sandy



Fig. 5: Quaternary map of China

soil, (3) clayey soil, (4) loessial soil, (5) salts and saline soils and (6) carbonates. The bedrock types on the map are grouped into three lithologic units: 1) carbonate rocks, 2) clastic rocks and 3) magmatic rocks. In addition to these features the map also displays structural lines, sand dunes, gravel and rock deserts in northwestern China, the distribution of permafrost, debris flow and mud flow features. In areas where drilling penetrates the entire sequence, geological symbols for the basement of the Quaternary are marked. The most important geological sections, stratotype localities of fossils, ancient cultural relics, etc. find mention on the map. All these points are numbered in succession from west to east and from north to south. Brief explanations are given on the margins of the map. In sum this map reflects the stupendous effort of geologists and cartographers to fulfill the requirements of the multidisciplinary scientists engaged in Quaternary research.

Professor Wang Nailing, one of China's seniormost geomorphologists gave a brief review of progress in geomorphological research with particular reference to the compressional and extensional landforms in western China, elaborating the factors responsible for these forms.

Dr. Ni Jiren presented an account of debris flows. He dealt with the phenomenon of debris flows, types of debris flows, theoretical models of debris flows, unsteady debris flows, steady debris flows, average characteristics of debris flows and deposition of debris flows. Debris flows are generally composed of a mixture of water, clay and rock particles of different sizes. The behaviour of these flows are determined by geological, geomorphic, climatic and hydrologic conditions. Disastrous debris flows are common in the southwestern parts of China and their monitoring has become essential. They are unsteady and intermittent, for example, after the first rush of debris flow has passed, the flow might possibly, but not necessarily stop. The flow is a random feature because it not only depends on the valley morphology but also on the supply conditions of materials from upstream areas. A two-phase flow theory model was discussed. Here the debris flows are considered as two-phase flows i.e. the solid and liquid phases. The liquid phase in the flow represents the unseparated slurry composed of water and fine particles, whereas the solid phase represents the coarser particles which interact act with the slurry and support its flow. Quantitative methods useful in the study of

debris flows were explained and a video recording of debris flow documentation was shown to us.

Dr. Zhang Shouyue took us across the fascinating karst landscape of China. Karsts are common in central South China and occupy 1/5 of the continental area and crop out over more than 1.25 million sq km. It is often said that the karst landscape has been an "enduring source of inspiration, entrancement and curiosity for travellers, artists, scientists and above all the dynasties of China from the 17th century till today". They occur in all the main tectonic regions of China. Karst is developed in rocks which differ widely in composition, texture and structure and which belong to formations ranging in age from the Archaean to the Pleistocene. Karstification of these carbonate rocks in various climatic zones has produced a variety of surface and subsurface features in China. In western China karsts occur on the Qinghai-Xizang Plateau. The first order classification of karsts in China is based on climate, where each region is a climatic zone with its distinctive water balance. The second order classification is made on the basis of tectonic units, where a given karst area displays similar geologic and tectonic history. The third order karst zonation is based on subareas. Distinctive karst landscapes are produced by different agencies acting on them. Thus karst in China may be divided into 4 regions, 8 areas and 14 subareas.

The second week of the training course was devoted to lectures on absolute dating methods, their principles and applications in China. We were also taken around the Peking University science laboratories for practical demonstrations of these methods. Professor Chen Tiemei gave a general review of all the dating techniques, including the Random Accelerator technique. Separate lectures were given on TL, ESR and EPR dating techniques by Dr. L.P. Zhou; on K-Ar dating by Dr. Zhiguo; on Fission Track dating by Dr. Guo Shilun and on ^{10}Be dating by Dr. Guo Shilun. In addition Dr. Yi Weixi gave a detailed account of *in situ* ^{10}Be dating by the AMS technique and its application to the dating of loess in China. Dr. Shi Ning described the laboratory techniques for extraction of radiogenic Be. It was interesting to learn that China has 30 radiocarbon dating laboratories and as many as 5 centres have K-Ar dating facilities. In addition to the existing AMS unit at Peking University, another was soon to be added.

The Peking University Remote-Sensing Department conducted a three day course on: 1. the application of computer techniques in geology and on the application of remote-sensing and computers to the study of erosion and deposition; 2. preliminary research on the Spatial Information System for Natural Resource Management and Environmental Monitoring; and 3. the Study of Land Surface Object Spectrum and Its Application in Remote-Sensing Saline

Soil. These lectures were followed by practical demonstrations.

After these lectures the faculty of IFAQ from Belgium took over from the Chinese. Dr. J.J. Huss gave a detailed picture of geomagnetism; Dr. I. Mariolakos from Greece discussed the tectonic aspects of Quaternary deformations in Greece; Dr. Paul Haessarts gave a lucid account of the Plio-Pleistocene sequence in Ethiopia; Dr. S. Jelgersma from The Netherlands spoke on the greenhouse effect and its impending hazards to human society; Dr. R. Paepe spoke on geosol stratigraphy; Dr. Cecil Baetaman described coastal subsidence induced by human activity; and Dr. Elfi van Overloop, the Director of IFAQ, introduced us to Spectrum Analysis.

On the 28th of July a geological expedition was organised to the Great Wall at Badaling.

During the last two days of the training course, Professor Nat Rutter, President of the XIII INQUA Congress, elaborated details of the Past Global Changes (PAGES) Project. This project is directed towards a better understanding of the natural and human-induced variations of the "earth system in the past, through the organization of coordinated national and international endeavours to obtain and interpret a variety of natural and written records". It is one of five core projects that have been established by the ICSU Geosphere-Biosphere Programme (IGBP). PAGES has two research themes — Stream I and Stream II. The objective of Stream I is to reconstruct the detailed history of climatic and environmental change for the entire globe for the period since 2000 B.P., with temporal resolution that is at least decadal and ideally, annual or seasonal and that of Stream II is to reconstruct a history of environmental change through a full glacial cycle, in order to improve our understanding of the natural processes that invoke global climatic changes. It has several underlying themes such as solar and orbital forcing and response, fundamental earth system processes, rapid and abrupt global changes and multi-proxy mapping. He laid emphasis on the fact that PAGES involves a coordinated effort, on a variety of natural and historical records, from various scientists who, until now, have been working independently of each other.

The training course was concluded on 1st August, on the eve of the opening of the XIII Congress of INQUA and Dr. Peter van Deventer from South Africa thanked the organisers on behalf of all participants.

My participation in all these programmes was made possible by the generous financial support and academic encouragement given by the INQUA executive councillors and the authorities of Karnatak University. Their kindness and generosity is gratefully acknowledged.

A Report of the XIII INQUA Congress Held in Beijing between 2nd and 9th August 1991

The International Union for Quaternary Research (INQUA) has its origins in the European Union for Quaternary Research (1928) and was renamed INQUA in 1932 at Moscow when many non-European countries joined the Union. It meets every four years and deliberates on global man-environment relationships both contemporary as well as during the last 2 million years. At present there are 36 countries sponsoring the activities of INQUA and China is the only Asian country among them. The programmes of the XIII Congress were spread over a period of 5 weeks which included pre- and post-Congress excursions to various Quaternary sections across China and a training course on Recent Research in Quaternary Geology held between 15th and 31st July. The main Congress deliberations on a variety of Quaternary problems under the theme *Humans and Global Change During the Quaternary* were organized between the 2nd and the 9th of August 1991. This was the first time that INQUA met in Asia and more appropriately in China. This country presents a broad spectrum of Quaternary geological and geomorphic features and has also made tremendous progress in Quaternary research. There were at least 900 delegates participating in the Congress, of which at least 500 hundred represented China and the remaining came from about 40 countries around the world.

The XIII INQUA Congress opened on 2nd August at the Beijing International Convention Centre in the newly developed Asian Games Village in north Beijing. The campus of the BICC has a convention building, intercontinental hotel, recreation centre, shopping centre, telecommunication facilities and even luxury apartments. The Congress was held under the sponsorship of the Chinese Academy of Sciences (Academia Sinica), the China Quaternary Research Association, the Natural Science Foundation of China, the Geological Society of China and the Geographical Society of China.

The Congress began with plenary sessions on the first and second days, at which convenors of various commissions and scientific sessions were the main speakers. These were followed by special and general sessions, poster

sessions, book exhibitions, business and scientific meetings of Commissions, Subcommissions and Inter-Congress Committees. English, French, German, Russian, Spanish and Chinese were the official languages of the Congress, however, most of the sessions and business meetings were conducted in English.

Symposia and scientific sessions went on for five days beginning on 3rd August and ending on the forenoon of 9th August. Nine to eleven concurrent sessions were held everyday. The programme of the deliberations was divided into 7 symposia and 9 general sessions.

The seven symposia focused on the following subjects:

- I. Global environmental changes (6 subsessions);
- II. Comparison of Quaternary in the two hemispheres (7 subsessions);
- III. Correlation between the continents and the oceans (5 subsessions)
- IV. Quaternary geology of Asia (8 subsessions);
- V. Applied Quaternary research (7 subsessions);
- VI. Abrupt events (6 subsessions);
- VII. Others (10 subsessions).

These sessions were conducted jointly by the convenors and co-convenors as scheduled.

The nine general sessions were grouped from A-I and each had a separate theme as follows:

- Group A. Problems of global environmental changes;
Group B. Quaternary stratigraphy;
Group C. Quaternary paleontology and paleoecology and biogeography;
Group D. Quaternary environmental changes;
Group E. Present geological processes;
Group F. Quaternary human evolution;
Group G. Applied Quaternary geology;

Group H. Quaternary geology in East Asia and its bordering seas;

Group I. Methodological advances in Quaternary research.

Poster sessions were arranged for all those papers which could not be accommodated in the above schedule and all the above themes were covered. More than 2050 abstracts were submitted to the Congress. At least 1700 papers were discussed in the 53 symposia and scientific sessions. Participation in business meetings of the INQUA Commissions and Subcommissions was open to those who had papers in the respective fields.

The Indian delegation to the Congress comprised the following senior scientists: Professor D.P. Agrawal from the Physical Research Laboratory, Ahmedabad; Dr. H.P. Gupta from the Birbal Sahni Institute of Palaeobotany, Lucknow; and Dr. D.C. Goswami from Gauhati University, Guwahati. In addition were the three participants from the Pre-Congress training course: Dr. Ravi Korisettar, from Karnatak University, Dharwad; Dr. B.S. Kotlia from Kumaon University, Nainital; and Dr. D.K. Borah from Gauhati University, Guwahati. Professor D.P. Agrawal had the honour of reviewing the work on palaeoclimate research in South Asia at one of the plenary sessions. He was also one of the convenors of a subsession on *Interdisciplinary Paleoclimate Research in Asia*, at which most of the Indian delegates presented their papers. In addition Dr. Korisettar read out a paper in the subsession on *Stratigraphic Application of Tephra* convened by Professor John Westgate and Dr. A.S. Wojciki.

Beijing is the capital of the People's Republic of China. It is not only the political and administrative capital but also "China's single greatest repository of monuments and treasures from the imperial era". It has a population of 12 million people and covers an area of 17,000 sq km, divided into 10 districts. The population of bicycles in this city — to date 9 million — appears to be growing at a rate faster than that of the human population! Visits to cultural centres and monuments in and around Beijing was constrained both by bad weather and packed academic programmes. However, short visits were possible to the Forbidden City, the Summer Palace, the Ming Tombs, the Temple of Heaven, Tiananmen Square, The Great Hall of the People and the Museum of History and Culture. During the last 5 years the metropolis has undergone a dramatic change in its architecture and layout. Fantastic avenues and rows of high rise structures line the broad thoroughfares and conceal the traditional onestory *pinfang* structures. Architecturally the city presents a combination of old and new standing together as mute witnesses to change through time.

The Congress concluded with the general body meeting on the afternoon of 9th August. A Congress dinner was arranged in the Great Hall of the People on the 8th evening. The outgoing President announced the election of the eighty-one year old Professor Liu Tung Sheng as the XIV President of INQUA. The next Congress is scheduled to meet in Berlin, Germany, in 1994.

Ravi Korisettar

An Announcement

Second AURA Congress and 1992 IFRAO Meeting 30 August-4 September 1992, Cairns, Australia

The second congress of the Australian Rock Art Association (AURA) will be held in conjunction with the 1992 meeting of the International Federation of Rock Art Organizations (IFRAO) in Cairns, in close proximity of the major rock art regions of north Queensland. More than 500 specialists will attend the 11 academic symposia, where about 200 papers will be presented, preceded and followed by several weeks of field trips. This is the principal international event in palaeoart studies and cognitive archaeology. Abstracts are called for now, and registrations will be invited shortly. For details, please contact AURA, P.O. Box 216, Caulfield South, Vic. 3162, Australia.

The AURA Congress is the largest event in the discipline of prehistoric art studies. A quadrennial assembly, it has been called the "world congress of rock art studies". The First AURA Congress was held in Darwin, Northern Territory, in 1988, and attended by 343 specialists from over 30 countries. The Second AURA Congress will build on the reputation it established, and will address the following specific subjects:

- A) Rock art studies: the post-stylistic era. Where do we go from here? Chaired by Michel Lorblanchet (France) and Paul Bahn (United Kingdom).
- B) Rock art and information exchange. Claire Smith (Australia).
- C) Rock art studies as a curriculum for teaching. Giriraj Kumar (India) and Osaga Odak (Kenya).
- D) The rock art of the Sahara. Alfred Muzzolini (France).
- E) Spatial considerations in rock art. Paul Faulstich (U.S.A.) and Paul Tacon (Australia).
- F) Dating of rock art. Alan Watchman (Australia) and Jack Steinbring (Canada).
- G) Preservation of rock art. Andrew Thorn (Australia) and Nicholas Stanley Price (U.S.A.).
- H) Management of rock art. Graeme Ward (Australia) and Bruce Ford (Australia).
- I) Rock art of north Queensland. Mike Morwood (Australia) and Noeline Cole (Australia).
- J) The ethics of rock art research. Robert G. Bednarik (Australia) and Mario Consens (Uruguay).
- K) General session. Chair to be nominated.

Abstracts (not exceeding 200 words) of papers on any of the subjects covered by Symposia A-J, or on any other palaeoart-related subject, are invited now. The official language is English, but a small number of papers in French, German, Russian and Spanish can be accepted. A time limit of 20 minutes applies and papers will be followed by question times of 10 minutes. AURA will have first publication rights of all papers.

The pre- and post-congress field trips program includes about 20 tours, with durations ranging from 1 day to 1-2 months. They will cover much of Queensland rock art as well as major concentrations in New South Wales, Northern Territory and Western Australia.